S. HRG. 101-673

SUPERCONDUCTING SUPER COLLIDER PROGRAM AND THE DEPARTMENT OF ENERGY'S BUDGET FOR FUNDAMENTAL SCIENCE

HEARING

BEFORE THE

SUBCOMMITTEE ON
ENERGY RESEARCH AND DEVELOPMENT

OF THE

COMMITTEE ON
ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE

ONE HUNDRED FIRST CONGRESS

SECOND SESSION

ON THE

SUPERCONDUCTING SUPER COLLIDER PROGRAM AND THE
DEPARTMENT OF ENERGY'S BUDGET FOR FUNDAMENTAL SCIENCE

APRIL 24, 1990

Printed for the use of the
Committee on Energy and Natural Resources

U.S. GOVERNMENT PRINTING OFFICE
29-832 WASHINGTON : 1990

★(Star print) For sale by the Superintendent of Documents, Congressional Sales Office
U.S. Government Printing Office, Washington, DC 20402

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SUPERCONDUCTING SUPER COLLIDER PROGRAM AND THE DEPARTMENT OF ENERGY'S BUDGET FOR FUNDAMENTAL SCIENCE

TUESDAY, APRIL 24, 1990

U.S. SENATE,
SUBCOMMITTEE ON ENERGY RESEARCH AND DEVELOPMENT,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC.

The subcommittee met, pursuant to notice, at 10:04 a.m., in room SD-366, Dirksen Senate Office Building, Hon. Wendell H. Ford, presiding

OPENING STATEMENT OF HON. WENDELL H. FORD, U.S. SENATOR FROM KENTUCKY

Senator FORD. Good morning, ladies and gentlemen. Today's hearing on the Superconducting Super Collider and the DOE science budget has become an annual event for the subcommittee. This is a very important part of the Department of Energy's budget.

In these programs the Department is fortifying foundations, foundations for the Nation's scientific and technological expertise and our international competitiveness. The fiscal year of 1991 requests for these programs is $2.3 billion, an increase of 13.6 percent over fiscal year 1990 appropriations.

We are talking about physics, chemistry, material science, mathematics, engineering, geoscience, biological and environmental science, and the major facilities where American science is practiced. DOE's proposed budget provides for broad-based support for science. It provides for growth. It also makes substantial commitments that will require Congress to vote much larger increases in the future.

The largest such commitment is a Superconducting Super Collider project that is getting underway in Texas. The fiscal year 1991 budget request for the SSC is $318 million, an increase of $100 million over last year's appropriations.

When we get into construction on the project, the annual appropriation needed for the SSC alone will be almost $1 billion. It is no secret that some of us are pretty nervous about this project. We are nervous about the commitment of resources involved. It has not made us any less nervous to learn that the total estimated cost of the SSC may increase by as much as $2 billion above the original estimate of $5.9 billion.

This project is being sold on the basis of two very different messages. One is the scientific merit of the project. We will hear about that from today's witnesses. The second is the public works aspect.

Selling the SSC as a big public works project has risk as well as benefits. You can promise money to Texas and to several other States. I gather that is happening. However, if this becomes just another big public works project, you could be on dangerous ground. Funding then becomes mainly a question of how much money does your State get and how much does my State get?

You face a different set of questions. If people see they can get more money some other way, or that they are not getting what they think they deserve, their support of the SSC could suffer. Your scientific arguments could be forgotten. The main motive could get to be jealousy.

I think you will see some of that in the debate in the House on Congressman Roe's SSC authorization bill. In two words: be warned. I hope you will sharpen your case for the project on its scientific merit.

The Subcommittee sent DOE a long list of questions about this project to be answered for the record of this hearing. We do not mean to be hostile in asking pointed questions of DOE. These are questions DOE should be able to answer if it expects to get the money that is being requested.

The Energy and Natural Resources Committee is the authorizing and oversight Committee for the SSC. It is the job of oversight to ask hard questions about cost, about management, and about how the SSC is going to fit into a balanced program of support for basic science. I intend to do the job to the best of my ability.

I am very pleased to have, as I said earlier, the real Chairman of this Committee with us this morning. Senator Johnston, do you have any opening statement?

[The prepared statement of Senator Ford follows:]

STATEMENT OF SENATOR WENDELL H. FORD

April 24, 1990

Subcommittee on Energy Research and Development
Hearing on the Superconducting Super Collider

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We intend to do our job.

STATEMENT OF HON. J. BENNETT JOHNSTON, U.S. SENATOR FROM LOUISIANA

The CHAIRMAN. Thank you very much, Senator Ford, and I want to congratulate you for having this hearing on what really is a very vital and important subject. I have a written statement which I would like to put into the record and just to make a couple of additional comments.

I have long been interested in high-energy physics. We cover high-energy physics not only in this committee but in my Appropriations Subcommittee on Energy and Water Development. It is safe to say that it is the most basic research of any kind that the country does, because it is inquiring into the very nature of matter, and nature of energy, and while the payoff from that research is difficult to quantify, to predict and to put a dollar value on, it is nonetheless at the heart of everything we do and everything we are. We are curious about what is in the cosmos—certainly we should be curious about what we are made of and what the cosmos is made of. So it is with a degree of great curiosity and fascination which I approach this subject.

I also approach it with a number of concerns. First, technological concerns: whether the design of this machine is proper; whether the incremental additions to our knowledge from this are worth the price; whether the scientific payoff from this machine justifies its existence. I think the answer to those questions is yes, but they are very important questions, and we should delve into that.

The second set of questions has to do with the budget. Can we find money for this particular endeavor? How much is it; how much cost overrun, if that is the right term. Sometimes I think we make mistakes by coming in with a low-ball figure and trying later to justify it. I was on the Senate Office Building Commission that built the Hart Senate Office Building, and they got some low-ball figure back in 1973, really not based on anything very solid, and we spent the next—oh, 16 or 14 years trying to answer the press on these huge cost overruns based on a figure which was really not a realistic figure to begin with and was not meant to be a real budget figure to begin with.

We should not make that mistake here. Whatever it is going to cost, let us state what it is, flatly and honestly, if we know. If we do not know, let us say so. But it seems to me that this business of coming out with a first figure and saying it has got to be exactly that amount, that it cannot exceed that, if it does, you have got to get it from such and such country, is not the way to run basic science.

If this thing is worth doing, it is worth doing, and it should not hinge on some artificially created dollar amount. Unless we cannot afford it to begin with—if we cannot afford it to begin with, then let us not do it. But I have just seen too much of trying to make unrealistic estimates to begin with and then trying to make the dollars fit later on when you cannot do it.

The second budgetary concern I have is really a general concern with science and this Government in that we do not have a science budget. Science is not considered in any Committee as a whole, where we justify one thing against the other, where we look at what we have got to spend on science and determine whether or not we ought to spend it on fusion, or on space telescopes, or on orbiting space labs, or on dozens of other endeavors in science. We just do them one at a time, and this one we are doing one at a time without reference to other endeavors in science.

I am not saying that this does not pass muster compared to other things, but I think the Government—the administration particularly—needs to start thinking about prioritizing science spending, because some things we are neglecting too much. I think the overall field of science is being neglected by this Administration in our pell-mell rush to try to satisfy Gramm-Rudman.

Finally, Mr. Chairman, I am concerned about the technology, about giving away our technology in order to try to squeeze this budget into this artificially created envelope. I met with the Deputy Secretary of Energy the other day, and he said look, the House may put a limit on this thing, so we may have to go make a contract with the Japanese or the Germans or whoever in order to give them some of the magnet business. So the highest technology, the building of the magnets, which can be a very important technology for the country to learn, really a manufacturing technology rather than an R&D technology, but a very important manufacturing technology, would go to foreign firms. I would hate to see us, for half a billion dollars, or $1 billion, or 10 or 12 percent of this thing, give away that which may be the most valuable thing the country can learn, and that is how to be the world leader in superconducting magnets.

I would like to hear some of the experts today talk about how valuable that manufacturing technology is, what the future of magnetically levitated trains and other uses to which we could put those superconducting magnets, whether it is worth really trying to keep that technology in this country. If so, then it looks to me like when we ask for participation we ought to ask for participation in digging the ditch or in stringing the wires or whatever else you do, rather than the cream of the technology.

So those are my concerns, Mr. Chairman, and I look forward to today's hearing.

[The prepared statement of Senator Johnston follows:]

STATEMENT OF SENATOR J. BENNETT JOHNSTON
April 24, 1990

Subcommittee on Energy Research and Development
Hearing on the Superconducting Super Collider

I congratulate Senator Ford for holding this hearing on the Superconducting Super Collider and the Department of Energy's budget for fundamental science. Under this budget, DOE funds and operates the major facilities that have made American science the envy of the world. We need to keep things that way.

The fiscal year 1991 request of the Department's science programs shows an increase of 13.6 percent over the appropriations for fiscal year 1990. It is very, very important that the funding of American science be maintained even though budgets are tight. In fact, it is important to make science funding grow at more than inflation. The President's budget proposes substantial growth.

Proposing an increase in the budget is one thing. Finding the money in the appropriations process under today's conditions is quite another. Finding the funds to accommodate the growth proposed for this year will be very, very difficult. We will need all the help we can get.

As tough as finding the money needed is this year, it pales in comparison to the difficulties we will have when construction is in full swing and the SSC needs several hundred million dollars annually from appropriations.

Our work has not been made any easier by the news that the total cost of the SSC may be $1.3 billion to $1.9 billion higher than the $5.9 billion estimate of last year.

The Administration has never provided Congress and the scientific community with a plan showing where the money for this project is coming from in those years. Indeed, in its report earlier this year to the Senate Budget Committee the Committee on Energy and Natural Resources wrote:

"The Committee is concerned that expenditures claimed by the SSC will inevitably be taken from many other worthy areas of scientific endeavor. The Department has never provided the Committee with a clear plan for funding the SSC in conjunction with these other important areas of fundamental research. The prospect of substantial cost increases for the SSC only emphasizes the need for such a plan."

DOE needs to provide us with such a plan. There is no reason not to provide it.

Congress has made the decision to build the superconducting super collider. We are not debating whether or not to have an SSC. What we need now is to see that the project is carried out in a controlled manner and as efficiently as possible. Some questions still remain. A final cost baseline must be developed that reflects site-specific knowledge and the latest experience with accelerator technology. The issue of foreign participation must be addressed. We should continue to review the management of the project to see that incentives to limit costs are effective.

Tough oversight by this Committee can help build the consensus needed to support the very substantial annual appropriations the project will soon require. DOE must answer the questions being asked about the project with patience and completeness. We will need the full cooperation from DOE, the scientific community, and industrial participants to carry the project through.

The SSC will be at the center of research in high-energy physics for the whole world for a generation. Its aim is to open the door to an understanding of the set of laws governs everything in the universe. As T.D. Lee, the Nobel laureate in physics, has said:

"It will be our contribution to the civilization of the next century."

Senator **Ford**. Thank you, Mr. Chairman. As usual, you bring a great deal of commonsense to most questions, and I am glad you are here.

Our first witness here this morning is a Congressman from Texas, the Honorable Joe Barton. And, Joe, if you come forward, we will be delighted to hear your testimony this morning. And it is at your discretion, either highlight it. We will put the statement in the record, or you can give the whole statement. We will leave that prerogative to you.

STATEMENT OF HON. JOE BARTON, U.S. REPRESENTATIVE FROM TEXAS

Mr. **Barton**. Well, thank you, Mr. Chairman.

It is a pleasure to be here again this year. I certainly recollect our testimony last year before this subcommittee with myself and Senator Bentsen and Senator Gramm. I will submit my statement for the record.

Senator **Ford**. It will be included.

Mr. **Barton**. And then summarize and make a few comments.

First of all, I would like to point out for the record, as you indicated, that the SSC is in my congressional district, literally in my backyard, about 3 miles from my home where the Eastern Cluster research facility will be located.

I have been working on this project for the past 5 years, since I was elected to the Congress in 1984 and sworn in in 1985. I am not going to belabor all the obvious points. You and Senator Johnston are experts in those. What I would like to do is simply bring you up-to-date on where we are right now on the project.

As we speak, in New York City Mort Myerson, the chairman of the Texas National Laboratory Research Commission, is negotiating with the bond attorneys to sell the first installment of the Texas bonds: $250 million. He is going back to Texas later this week and going before the Texas Bond Commission to get approval on the terms of that agreement. I think he is going to do that on April 26 of April 27.

The State of Texas Highway Commission is working with a private contractor from Oklahoma to prepare to go out and begin to make bids on the land that needs to be acquired. We need to acquire 17,000 acres of land for the project. That is happening right now.

As you indicated in your opening statement, the SSC permanent authorization bill will be considered on the House floor. The sponsor of that legislation, as the chairman of the Science, Space and Technology Committee, is the Honorable Bob Roe of New Jersey. It would put a $5 billion cap on federal expenditures. It would set some parameters on international participation.

It has some safeguards, some milestones about magnet testing and certain certifications that have to be made before construction of the project can go ahead. That piece of legislation passed the authorizing committee 32 to 9. And we expect it will pass the House.

I would like to point out for you and other Senators of this subcommittee that, this authorization bill is going to the floor under an open rule, which means literally that any Member of Congress and the House of Representatives can stand up on the floor and offer an amendment to the project.

We are very confident that we can debate the merits of this project in the open, as Senator Johnston said. We think that the project makes sense on a national priority basis, a scientific research and development priority basis. And we are more than willing to debate any amendment and have an up or down roll call vote tomorrow.

And Dr. Schwitters, Dr. Decker, and Dr. Bromley who are going to testify after me are the true experts on this, and they can handle the technical details.

I would simply like to close by pointing out that as we move away from confrontation with the Soviet Union, hopefully, we are going to be in even more intense competition with our trading allies—the Japanese, the Europeans, the Asians. And the SSC is really about scientific leadership. Scientific leadership leads to economic leadership. Economic leadership leads to world leadership.

As Senator Johnston pointed out, the price of this project is high, but the price of leadership is high. And I think we should meet that price. The Federal Government spends $4,000 a second. The request for this year, the next budget year, $318 million. If you divide that up, that is about two hours worth of federal spending. And I think the price of scientific leadership is worth two hours of spending. So with that, I would be happy to answer any questions.

[The prepared statement of Mr. Barton follows:]

TESTIMONY

OF

CONGRESSMAN JOE BARTON
TEXAS, SIXTH DISTRICT

BEFORE

SENATE ENERGY & NATURAL RESOURCES SUBCOMMITTEE
ON ENERGY RESEARCH AND DEVELOPMENT

HEARING ON
ENERGY DEPARTMENT'S SUPERCONDUCTING SUPER COLLIDER PROGRAM

APRIL 24,1990

10:00 A.M., 366 DIRKSEN

"SUPERCONDUCTING SUPER COLLIDER (SSC): A NATIONAL PROJECT"

Mr. Chairman, Members of the Subcommittee, good morning and thank you for giving me the opportunity to testify before you today in favor of an outstanding investment in our future, the Superconducting Super Collider (SSC). As you may know, the Super Collider will allow the United States to pursue excellent basic scientific research fundamental to the understanding of the universe. This basic research should result in new technologies, new advances in medicine, and increased economic growth.

Recently, the House Science and Technology Committee passed, H.R. 4380, a bill permanently authorizing appropriations for the SSC. The vote was 32-9. The bill, sponsored by the Chairman of the Committee, Robert Roe, includes a Federal spending cap of $5 billion for research, design, and construction of the SSC.

Mr. Chairman, I know you and your Subcommittee have concerns about the SSC cost estimates. The Department of Energy is expected to soon announce a higher cost estimate that the $5.9 billion figure that has been associated with the 1986 project design. This does not, in any way, mean a cost overrun. It will simply be the first true cost estimate for the project as it is proposed to be built. About half of the expected increase is due to design changes made necessary by the incorporation of technical information about the operations of accelerators that was not available at the time the conceptual design was prepared. The other half of the expected increase comes from revising the technical and economic assumptions that were used in the earlier estimate to provide a greater degree of accuracy. The revised cost estimate for the project is expected between $7.2 and $8.0 billion. The funding request is for $318 million with $129 million for construction.

We spend approximately $2 million a minute at the Federal level. So, if we fund the SSC at $318 million, we are funding at the rate of just two hours of the Federal budget. This is a small price to pay for a project that is as important as the SSC.

Since the emergence of high energy physics as a separate field of research, the United States has led the world. However, I am concerned about losing our preeminence in high energy physics to Europe. The Center for European Research-Nuclear (CERN) has just begun operating an electron collider, and in the next few years will be operating a proton collider. By building the SSC, the United States will maintain its leading position in this crucial field of basic research.

Understanding the nature of the world around us will provide research advances of literally cosmic proportions. Funding the Super Collider allows the United States to remain in the forefront of basic science technology for many years to come. Since 1975, American scientists have won half of all Nobel Prizes in physics; however, Europeans have won the last eight. This is a clear indication we are losing our leadership position in high energy physics. If we ultimately lose our leadership position in high energy physics, we will lose our leading edge in world economics.

Many exciting developments are happening with regard to the SSC. The Second Annual International Symposium on the SSC was recently held in Miami, Florida with over 700 attendees. They came from over 35 states and 12 foreign countries. Industry groups and universities from almost every state in the union were also there. At this conference Deputy Secretary Henson Moore released the footprint for the final ring location and asked Texas National Research Laboratory Commission (TNRLC), Chairman Mort Myerson, "to start buying the land." A detailed study has been carried out to give an accurate picture of the underground structure at the site and that, in turn, has enabled us to determine the optimum placement of the collider ring, or "footprint."

The U.S. Department of Labor has also released the results of the Davis-Bacon wage survey establishing the prevailing wage rates to be paid in building construction jobs for the SSC site. More than 6,000 contractors and subcontractors were invited to participate in the wage survey, encompassing over 3,000 building projects. The Department of Labor collected wage payment data from several thousand contractors and subcontractors representing 17,588 workers in 81 crafts.

Also, The American Physical Society, recently passed a resolution by the Executive Committee of The Division of Particles and Fields in support of the SSC. In summary, the Resolution states that the SSC will be a world class scientific laboratory and will deepen our understanding of the basic laws of nature. The Executive Committee also strongly supports the President's budget request for FY '91 of $318 million, and finally, the Resolution states that the Society supports the passage of H.R. 4380, the SSC authorization bill, and the expeditious construction of the SSC.

Although the exact applications which will flow from the construction and operation of the SSC cannot be predicted with absolute certainty, past investments in basic research have been repaid 100 times over. The United States has always been a nation that looks towards the future; whether technically in this century, or whether geographically in the 1800's westward expansion, or whether in our democracy with expansion of freedom around the world.

To quote a Nobel Prize winner from the University of Chicago, James W. Cronin: "The spirit of a nation and the pride of its people can only be enhanced when science, including the exploration of our planet, solar system, galaxy, and universe is among its highest priorities."

The SSC should be amongst our highest priorities. I urge this Subcommittee to fully support this essential project.

Thank you again, Mr. Chairman for the opportunity to be here today.

Senator FORD. Thank you very much, Congressman. It is normally as a courtesy we do not ask questions, but I am going to break that courtesy this morning, if I may, with you.

Mr. BARTON. Yes, sir.

Senator FORD. In order to get a couple of points on the record, they will not be tough questions.

Mr. BARTON. Remember I am an Aggie, now. So, you pointed that out.

Senator FORD. I understand, but you have not been kicked by a Kentucky mule yet. [Laughter.]

I understand that in some quarters there is concern about Texas contribution to the project. Let me ask you this question, is Texas offering $1 billion plus the necessary land? Or is the value of the land part of the $1 billion? Can you clarify that for us?

Mr. BARTON. I would be very happy to, Mr. Chairman.

As you know, when the six states were in the competition to be selected as the site of the SSC, part of the proposal was that every state had to provide the land free of charge to the Department of Energy—every State. And every State made that promise.

One state on top of that promised more—Texas promised the land plus $1 billion. Now, I would point out that when Texas was designated as the site in November 1988, the plan at that time was to begin land acquisition in April 1989.

The original land acquisition plan was supposed to be completed this month. Because of a lot of very relevant reasons, land acquisition is not going to actually begin until May or June of this year. But in spite of that delay the State of Texas said, we will furnish the land free of charge, and we will also provide an additional $1 billion. You know, Texas has always honored its commitments. It will honor that commitment.

Senator FORD. When will Texas enter into a written arrangement with DOE to govern this contribution?

Mr. BARTON. Mr. Chairman, I am not technically qualified to answer that question. I am sure Dr. Decker, or Dr. Schwitters could do so. I do know they are having consultations right now. And it is my understanding that those negotiations will result in some sort of a formal agreement later this summer.

Senator FORD. Are you confident that the management structure can keep the project under control?

Mr. BARTON. To be honest, Mr. Chairman, in the past year-and-a-half, I have had some concerns about that. I have spoken with Secretary Watkins, Deputy Secretary Henson Moore, Dr. Schwitters, the head of the laboratory, and Dr. Allan Bromley, the President's scientific advisor, about some of those issues.

I have great confidence in the personnel that are in place. I think some of the terms of the authorization bill that is under consideration in the House should alleviate some of those problems. The Department of Energy and University Research Associates have come a long way in the last year to put in place a good management system.

Senator FORD. Did I understand that you think Congressman Roe's bill will be passed by the House?

Mr. BARTON. Yes, sir.

Senator FORD. And that will set a cap of $5 billion?

Mr. **Barton**. That is correct—Federal.

Senator **Ford**. Federal funding?

Mr. **Barton**. Federal share, yes, sir.

Senator **Ford**. The federal share will be $5 billion. If I felt you right and the statement of our chairman, we are very concerned about broadening out foreign participation. We would like to keep this an American project?

Mr. **Barton**. That is the entire subject of the international plan. It is something that needs to be fleshed out this year in the Senate and the House. There is great concern, as Senator Johnston indicated, in the American industrial community that the manufacturing technology, not necessarily will be given away, but that the American corporations will not have an opportunity to develop it or to use it.

There is a provision in the House authorization bill that requires 50 percent American participation in every aspect of the project. The administration has expressed some concerns with that. But I would support that. I think that, while I do not think we can make every aspect of the project 100 percent American, I do think that there should be an American or United States participation in every aspect of the project.

Senator **Ford**. Fine, thank you, Congress.

Senator Johnston, do you have any questions?

The **Chairman**. Thank you very much, Joe, for a good presentation. I would just say that to me, it does not pass muster to say, American participation. On the high technology things, the things that are worth doing, that are really valuable, we have to learn to do them, and do them here, not send that out of the country.

I mean, if somebody wants to give us some money, so that they can send some scientists over to look at quarks and leptons and all that—great. But do not try to come in and get the cream of the technology here by agreeing to build half the magnets or something. I mean, the way to get this thing in political trouble, I think, is to give away the good technology, and I hope we do not do that.

Mr. **Barton**. I have no argument with that, Senator. As you know, if we cap federal expenditures at $5 billion, and the State of Texas puts up $1 billion plus the land, that is $6 billion. We expect the latest cost estimate, the engineering estimate to come in between $7.2 billion and $7.8 billion.

So that is going to be made up with foreign participation or some sort of creative private financing in this country. And as you know, in some aspects, our international allies are ahead of us. The Italians built the magnets that are now at CERN. The Japanese have some technology in terms of magnet fabrication that they consider to be the best in the world.

So in some of these areas, American companies can actually benefit by joint ventures. And, you know, it is in my opinion, as long as we mandate, require at least a 50 participation by an American company, that in some ways will be the best of both worlds.

The **Chairman**. They may have better R&D in some respects. The Italians are right up in the state of the art. But in manufacturing technology, if we do it here, then we learn the manufacturing technology.

Mr. **Barton**. I understand.

The **Chairman**. I mean, it is not just the R&D. They may be ahead in the R&D.

Mr. **Barton**. We want the jobs, and we want the manufacturing jobs in the United States.

The **Chairman**. Well, more than that. We want the manufacturing technology. I mean, it is like the Japanese. We invented so many of those things on automobiles, invented it here, but they learned the manufacturing technology and that is why they sell more Toyotas and other automobiles than GM sells in some respects. At least, that is why they are getting more of the market, and so that is what I am interested in, is learning that technology.

Thank you very much.

Mr. **Barton**. Thank you.

Thank you, Mr. Chairman.

Senator **Ford**. Thank you, Joe. We appreciate your coming and we will continue to work with you and look forward to it.

The next witness this morning is the Honorable D. Allan Bromley, Director, Office of Science and Technology Policy, Executive Office of the President. Good morning, Mr. Bromley.

I understand you have a time schedule this morning?

Dr. **Bromley**. Yes, sir.

Senator **Ford**. We will be delighted to try to accommodate you in any way in order to have your testimony, and you can highlight your statement, whatever, and I will try to limit my questions, give you some in writing, so if you want to proceed we look forward to your testimony.

STATEMENT OF DR. D. ALLAN BROMLEY, DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY POLICY, EXECUTIVE OFFICE OF THE PRESIDENT

Dr. **Bromley**. Thank you, Mr. Chairman. I have provided formal testimony and I will not do more than touch on that. I would like to add a few additional points in my oral presentation with your permission.

Senator **Ford**. Your text will be included in the record as if given, Mr. Bromley, and you may proceed.

Dr. **Bromley**. Thank you, Mr. Chairman.

I am of course delighted to be here with you this morning to discuss the Department of Energy's proposed budget for research and fundamental physical sciences activities, including the Superconducting Super Collider. In my view the research that is supported by the Department of Energy is a very important component of our Nation's science and technology enterprise in that it has consistently been of very high quality with very substantial benefits to our society.

In general, I would have to emphasize the very high priority that this administration places on research and development as an investment in the Nation's future. This was demonstrated, of course, in the President's budget submission to you a few months ago, and even in areas of basic research, such as the kind of research we are discussing today, I believe that investments in science and technology can pay important economic and social dividends.

Just to pick an example more or less at random, we now use positron-emission tomography—PET scans—not only to observe the structure but also the realtime function of the human brain. This is a remarkable technology that allows diagnosis and clinical study of the function of the brain in this, the decade of the brain. It is important to remember that this technology derived from studies that had nothing to do with this area but were designed to understand the behavior of radioisotopes and were part of the Department of Energy program.

At the same time, sir, I feel it very important to emphasize that basic research is inherently valuable above and beyond its possible utility. The expansion of knowledge that is involved—and I do not think I need to convince any of you gentlemen—is an adventure on which our society is embarked and I, for example, consider myself singularly fortunate to have been able to spend so many decades of my career on that adventure. The question that emerges simply is, what can we afford on the frontiers of human knowledge? That, gentlemen, is a decision that ultimately is yours.

The President's 1991 budget affirms the key role of science and technology in our Nation's economic competitiveness, security, and quality of life, as well as the fundamental value of scientific research. It calls for $71.2 billion in Federal research and development, an increase of 7 percent. Special consideration has been given to civilian R&D, which would rise 12 percent, and to basic research, which would go up by 8.

I think it is important, if I may, sir, to emphasize that in the formulation of such a budget there are certain fundamental criteria, and in coming up with this budget there were three that we applied. If I could take a moment to emphasize them. First, we believe that it is essential to provide support for those programs that address national needs and national security concerns. This includes, for example, such things as environmental cleanup, improvement of science and mathematics education, development of our presence in space, and the maintenance of the defense technology base.

Second, we believe that we have a major obligation to support basic research, specifically university-based, individual investigator, small-group research, which I feel still constitutes the heart and backbone of our science and technology enterprise. This is the reason, for example, why this administration supports very firmly the doubling of the NSF budget by 1993.

Third, Mr. Chairman, we have to provide, I would submit, the funding for the scientific infrastructure and facilities that will keep this country at the forefront of advancing intellectual frontiers. Large facilities are essential if American science is to remain at those research frontiers, and once the facilities such as the Superconducting Super Collider are built they will serve literally thousands of scientists and make possible scientific understanding, as we have heard before, not only of our universe but of ourselves and of the role that we play in that universe.

The influence of these priorities can be seen in the Department of Energy basic research programs that we are discussing today. Funding for each of the areas that we are discussing would rise under the 1991 budget, as I shall discuss in a moment. But first, Mr. Chairman, with your indulgence, I would take a moment to emphasize that the kind of priorities I have just mentioned influence other areas of the DOE budget that we are not specifically addressing this morning, including basic research conducted in the Department's biological and environmental research programs.

I have in mind two specific areas: the U.S. Global Change Research Program, where the DOE portion will increase by 33 percent; the human genome project, in which DOE shares $46 million; and, in addition, DOE funding for programs in science, mathematics and engineering education, which are slated to rise by 47 percent in this coming year.

Now, funding for the Superconducting Super Collider, Mr. Chairman, as you know, falls within the budget of the General Science and Research Division, and the proposed funding for SSC in 1991 is set at $318 million, up 46 percent.

SSC has been approved by two Presidents and by the Congress. There have always been two very important provisos attached to those approvals. The first is that one-third of the cost, whatever that cost might be, must be borne from non-Federal sources. The second is that moving forward with the SSC must not cut into the underlying science and technology base of the Nation.

Both of these provisos continue to apply. If I might elaborate on the second, the administration has in fact requested increases for nuclear physics, high-energy physics and basic energy science programs within the DOE, and thus we are continuing to support the efforts of individual investigators while going forward with important national facilities.

If I could first take up the budget of basic energy sciences, the administration has requested a 14 percent increase in funding, bringing the total to $649 million. This funding will allow U.S. synchrotron light sources and other facilities to be operated at levels that would let us reap the scientific reward of the investments that you gentlemen have helped us make in these facilities.

Increased funding will also provide for continued construction of the new light sources that have been enthusiastically supported both by industrial and academic workers. This is a new era in materials science that depends on the existence and the availability of very large facilities that originally were developed in particle physics.

Unfortunately, it is not possible to simultaneously provide broad increase in the basic energy sciences for individual sciences and groups this year, except in a few explicitly identified areas of special importance; high-performance computing, which we have discussed before, sir, is one of those areas. We plan to use mechanisms that I have described previously such as the Federal Coordinating Council, FCCSET, to develop programs for these priority areas and to identify other areas where future increases in research support at the Federal level will be urgently required and justified.

The nuclear physics program in DOE is slated for a 14.2 percent increase. This program supports about 50 percent of the university-based research in this discipline within the United States. Most of the increased funding will be used, Mr. Chairman, to permit additional utilization of some facilities in high-priority sub-areas, new instrumentation, particularly for university groups, and increased operating costs generally. We will also provide funding for continued construction of the CEBAF accelerator and for initiation of the construction of a very exciting new project, which will be absolutely unique in the world, the Relativistic Heavy Ion Collider, which will be built using part of the investment that already was made in the colliding beam accelerator on Long Island. This collider will again take us back to the first microseconds of the life of this universe, and it is a program that I support enthusiastically.

In the high energy physics program, the 1991 budget calls for an increase of 6.7 percent. This will keep U.S. activity in this very important forefront area moving forward in parallel with the construction of the Superconducting Super Collider.

It will permit effective utilization of our three major accelerators—Fermilab, SLAC, and the Brookhaven AGS—each of which occupies a unique niche world-wide, and each of which will retain the participation of the young scientists who will be developing their careers and who will be ready when the SSC is completed to exploit that facility aggressively.

Let me turn to the SSC itself. It, in my view, is an essential tool that is required for the next major step forward in a fundamental understanding of the forces of nature and of matter itself.

Research in particle physics over the past two decades has resulted in what I consider to be an absolutely historic advance. The theory that has tied together the electromagnetic and weak forces of nature is truly an historic advance. It has been dramatically successful in predicting, ahead of measurement, the masses of both the W and Z particles and has provided a standard model, or the base for a standard model, that is by far the most successful model that has yet been advanced to describe the fundamental aspects of our universe. Within this past two years, Mr. Chairman, work that has gone on measuring the lifetime of the Z particle has given us what I again consider a truly exciting result; namely, that there are only the three families of fundamental particles and no more. And that kind of limiting on the number of particles involved in the construction of our universe is, I think, truly fundamental.

Now, in March 1986 the SSC design group settled on 20 TeV per beam as the appropriate energy for a machine to investigate the kind of questions that this understanding lays out for us. The question of where does mass come from, for example, or how did the mass and energy in the universe originate. And these are questions that underlie everything else that we understand and hope to understand about nature. So this design group developed a site-independent conceptual design that, as was stated earlier, was estimated to cost $5.9 billion. That was a conceptual design estimate.

After the selection of the Ellis County, Texas, site, the professional group that will be charged with actually building this accelerator, bringing it into operation, incorporated new information. As always in such circumstances, they were somewhat more conservative than the conceptual design group. They took into account the experience developed at the HERA accelerator in West Germany and on the basis of this, Mr. Chairman, decided that two significant design changes were required: the first reflecting the fact that in the magnets there is always, if you will, a certain small ripple effect at the end. In order to keep that ripple effect from making the performance less than promised, it became essential to increase the energy of the injector from one to two TeV to make the beam stiffer as it entered the main accelerator. Secondly, in order to avoid losing part of this precious beam as it circulates on the 54-mile loop of the magnets themselves, it became essential to increase the bore of the magnet from 4 to 5 centimeters.

Now, both of those changes are reflected in additional cost. Earlier this year, a HEPAP subpanel chaired by Professor Drell, who will be testifying later this morning, confirmed the critical importance of the design goal of 20 TeV. That group concluded, and I quote, "If the beam energy drops appreciably below 20 TeV, one cannot guarantee sensitivity to important new phenomena and, therefore, encounters the serious risk that the SSC might fail to deliver on its promise to elucidate the nature of electroweak symmetry breaking."

The subpanel also concurred with the SSC Laboratory's proposal to modify the magnet aperture and injection energy to achieve the goal that had been set forward on the basis of the physics.

The President's budget for 1991 requests, as I noted, $318 million for the SSC, and we believe that this will allow the project to proceed expeditiously. Work, quite correctly, will be focused particularly on the critical issue of the 5-centimeter superconducting dipole magnets. I have said on earlier occasions that I view the successful fabrication first of full-size prototype magnets and then of magnets constructed on an industrial scale as critically important milestones for the project.

There is no question, however, Mr. Chairman, in my mind, that these magnets can and will be made to work. The important and most difficult task will be that of developing manufacturing techniques for the mass production of these magnets with the requisite combination of throughput and quality control. But here, too, let me emphasize that I have faith in our industry. Our industry can do this.

The superconducting super collider then, sir, has enormous scientific merit. It will be essential to unraveling fundamental mysteries that are at the forefront of modern physics.

We in the administration are committed to making this project a great success, and we propose to do so while providing strong support for individual scientists in this and in other areas of science. We look on the SSC as a critical part of this administration's initiative to strengthen America's position as a world leader in science and technology. And that, Mr. Chairman, concludes my opening remarks. I would welcome your questions.

[The prepared statement of Dr. Bromley follows:]

STATEMENT

by
D. Allan Bromley
Assistant to the President for Science and Technology, and
Director, Office of Science and Technology Policy

before the
Subcommittee on Energy Research and Development
of the
Committee on Energy and Natural Resources
United States Senate

April 24, 1990

Thank you for the opportunity to discuss this morning the views of the Office of Science and Technology Policy (OSTP) on the Department of Energy's proposed budget for research in the fundamental physical sciences and related activities including the Superconducting Super Collider program. The FY 1991 request for DOE reflects significant investments in research at the frontiers of science, and in the research and education infrastructure that is critical to our future.

The Administration assigns high priority to science and technology. The FY 1991 budget affirms the key role of science and technology in the nation's economic competitiveness, security and quality of life. Before turning to the specific DOE-funded activities under discussion this morning, I would like to review some of the factors underlying our focus on science and technology, then describe the guidelines for setting budget priorities. I also want to highlight briefly the overall S&T budget.

INVESTING IN THE FUTURE

The President's budget proposal emphasizes investments in the future. One of the most effective ways to invest in our future is through support for research and development in science and technology. Research and development yield new knowledge, products and processes that contribute substantially to our economic well-being and to improvements in our welfare. Investments in R&D have a high social rate of return -- through economic growth, enhanced quality of life, and development of human resources.

The United States spends more on R&D than does any other country in the world. Investments in R&D increase our capacity to innovate and also expand our knowledge base. Our ability to commercialize scientific and technological innovations effectively is a major factor in assuring long-term economic growth and competitiveness.

The contributions of science and technology to our quality of life are pervasive. We have a history of immense achievements in health, food supply, communication, transportation. In the fundamental sciences that are the focus of DOE support, major contributions have been derived from research. For example, Positron-Emission Tomography (PET), widely used for medical diagnosis and for brain research, is based on earlier basic research involving radioisotopes. The investigation of possibilities for safe underground storage for radioactive waste uses accelerator mass spectrometry of ^{36}Cl as a sensitive monitor. These techniques also were developed in the course of basic research.

In addition to addressing specific opportunities or pressing issues, the research investments proposed in FY 1991 expand the frontiers of human knowledge. I am convinced that responding to this challenge has intrinsic value for our quality of life, beyond quantitative measure.

Investments in R&D also entail investments in education and human resources. Support for basic research, at both universities and national laboratories, is essential not only to the health of the research enterprise, but to the development of future scientists and engineers. More broadly, "human capital" is a critical component for improved productivity. The key role of science and mathematics in developing human capital is recognized in the education goals recently set by the President and the Governors. One of these goals is that U.S. students be first in the world in science and mathematics achievement by the year 2000.

Education at all levels needs to be revitalized. This revitalization involves not only the training of scientists, engineers, and the technical workforce but also the education of a population sufficiently literate in science and technology to deal with the social issues arising from rapid scientific and technological change. Achieving such a goal requires a broad-based approach involving businesses, academia, educational organizations, and State and local governments. Responsibility belongs to every sector, not just, and not primarily, to the federal government.

SETTING PRIORITIES

The Administration's emphasis on R&D provides a basis for budget formulation. Within that framework choices must be made. In the course of determining optimum allocation of funds across the R&D agency budgets, the Administration has applied three quite simple guidelines:

- o **Support should be provided for programs that address national needs and national security concerns.** Examples are the federal environmental clean-up effort, scientific research to address global change, a preeminence in space, and adequate support for the defense technology base. Implicit in this is consideration of the balance of R&D funding for civilian versus defense needs.

o **Basic research must be adequately supported.** Basic research is the wellspring of our future scientific and technical progress. Specifically, university-based, individual investigator and small group research still constitute the heart of our science and technology enterprise. Funding for this research must be protected to maintain the diversity and vitality of American science and technology.

o **Funding for the scientific infrastructure and facilities in this country must keep pace with advancing intellectual frontiers, and must provide the base for maintaining our scientific preeminence.** Large facilities such as the Superconducting Super Collider (SSC) are essential if American scientists are to remain at the research frontiers of their fields. Once these facilities are built, they serve thousands of scientists and make possible a scientific understanding of the world and universe in which we live. They are essential for the health of our R&D enterprise.

With this background on the pivotal role of science and technology for the future, I would like to highlight briefly some aspects of overall S&T support the President's budget request, and then turn to the DOE fundamental physical science programs.

SCIENCE AND TECHNOLOGY IN THE FY 1991 BUDGET

The Administration's FY 1991 budget proposes a healthy increase of 7 percent in the conduct of both civilian and defense R&D. Even more encouraging to me is the distribution of that funding. The Administration's proposals would increase civilian R&D 12 percent, from $23.8 billion in FY 1990 to $26.7 billion in FY 1991. Basic research would go up about 8 percent, from $11.4 billion to $12.4 billion. At a time of declining real defense expenditures, proposed defense R&D would rise by 4 percent and defense basic research by 5.9 percent.

Altogether, the total conduct of R&D, both civilian and defense, would rise to $68.1 billion. Adding $3.1 billion for construction, repair, and modernization of R&D facilities brings the total proposed federal support for R&D to $71.2 billion. This amount is 5.1 percent of the total budget for FY 1991 and 1.3 percent of the U.S. gross national product. In FY 1990, the corresponding percentages were 5.0 percent of the total budget and 1.2 percent of GNP.

This year's budget proposals have the effect of changing the proportions of civilian and defense R&D funded by the federal government. During the 1980s, defense R&D rose much faster than civilian R&D, reaching a peak of 69 percent defense and 31 percent civilian in 1986. Since 1986, the ratio of civilian R&D to defense R&D has been growing steadily, and in FY 1991 civilian R&D is projected to be 39 percent of the total conduct of federal R&D.

The Administration is committed to doubling the budget of the National Science Foundation (NSF) by 1993 from a base year of 1987. Research funding in the National Science Foundation would increase by about 11 percent, while science and engineering education increases by about 23 percent, for an overall NSF increase of 14.3 percent in FY 1991 to $2.4 billion. Over 90 percent of NSF's budget supports basic research, primarily at colleges and universities. NSF supports a broad range of research, within its open mission to assure the health of science and engineering in the U.S.

Funding for the National Aeronautics and Space Administration (NASA) is proposed to increase 24 percent overall, to a total of $15.2 billion. Within the $2.9 billion increase for NASA is $2.0 billion in additional support for R&D, bringing NASA's total R&D effort to $9.3 billion in FY 1991. The Space Exploration Initiative, Space Station Freedom, and Mission to Planet Earth are part of an overall strategy to maintain the nation's world leadership in space by establishing a transportation infrastructure; expanding the space frontier through manned exploration; using space to increase our scientific understanding; and developing the commercial potential of space.

Research and development in the Department of Defense (DOD) is proposed to increase by 4 percent to $39 billion in FY 1991. Basic research would grow by 5.9 percent, to $978 million. A strong research and technology base is the key to our national security, and is critical to enable investigation into promising new technologies and to guard against technological surprise.

I wish also to highlight the multi-agency investments planned for science, mathematics and engineering education. The FY 1991 budget proposes a total of $1 billion for this purpose across five agencies, an increase of 26 percent above FY 1990. A variety of programs provide support for teacher training, curriculum development, and direct assistance to students. The National Science Foundation, National Institutes of Health, Department of Education, National Aeronautics and Space Administration, and Department of Energy are moving aggressively on a number of fronts to address shortcomings in our S&T education enterprise.

PHYSICAL SCIENCE AND ENGINEERING RESEARCH IN THE DEPARTMENT OF ENERGY

With this perspective, let me turn now to the Administration's proposed FY 1991 funding for the Department of Energy activities in the areas of particular focus in this Hearing -- fundamental science and the SSC project. Support for these activities comes from the DOE budgets for General Science and Research and for Basic Energy Sciences. The Administration has requested an increment of $175 million for General Science for FY 1991, for a total of $1.3 billion. This increment is divided among high energy physics (up 6.7 percent), nuclear physics (up 14.2 percent), and the Superconducting Super Collider (up $99.3 million or 45.4 percent). Funding for research in the Basic Energy Sciences is requested by the Administration for FY 1991 at a level of $648.7 million, 13.8 percent above the FY 1990 level. I will return to these activities in a moment, but I want to digress briefly to note that the President's budget proposal does not call for building SSC at the expense of other research areas. Indeed, it is Administration policy that the SSC construction will not be permitted to impact adversely the overall level of federal support for the conduct of research by individual scientists, small groups, or the users of large facilities.

Of course, difficult choices always will have to be made, and this year was no exception. Overall, the DOE R&D budget is proposed to increase by 3.1 percent to just under $7.4 billion, but the priority-setting guidelines that I outlined above led the Administration to propose significantly greater changes in selected subareas. Thus, the Department's Global Change Research Program will increase by 32 percent to $66 million in FY 1991. Funding to support the Department's programs in science, mathematics and engineering education will increase by 47 percent to $25 million. Defense-related R&D will continue at a level of effort slightly below that of FY 1990.

Basic Energy Sciences

The BES program supports research that advances our fundamental understanding of the science and technology that underpins our national energy supply. The program provides direct support for over 4000 investigators in the physical, biological and mathematical sciences. In addition, the BES program provides support for the operation of a variety of major user facilities, such as synchrotron radiation sources, neutron sources and the Combustion Research Facility. The facilities are used for research by scientists from industry, academia and government laboratories. They provide a fertile environment for crossdisciplinary research and for the transfer of scientific knowledge and technological know how between the public and private sectors.

As one component of the Investing in the Future theme, the President's FY 1991 budget requests a significant increase ($31 million) for construction and improvement of national user facilities in the BES program. The major increment in this category supports continued construction of the 6-7 GeV Synchrotron Radiation Source at the Argonne National Laboratory. A 6 GeV synchrotron radiation source was accorded highest priority for new construction by a 1983 advisory group drawn from the synchrotron radiation users community. This priority was affirmed by the Major Materials Facilities Committee of the National Academy of Sciences and has subsequently been reaffirmed by several other advisory groups. When completed in 1996, this facility will provide uniquely brilliant beams of hard x-rays for research in a diverse array of fields, including physics, chemistry, materials and surface science, biology, and medicine.

It makes absolutely no sense to build these splendid facilities -- facilities that set the stage for great forward strides -- unless we are prepared to operate them, and to support the scientists who use them, in such a way as to reap the scientific and economic rewards of the research they make possible. The President's budget takes this into consideration by adding approximately $32 million to provide a more healthy level of funding for operating the Programs's existing user facilities. It is my intention to work -- through the Federal Coordinating Council for Science, Engineering and Technology (FCCSET) new Committee on Physical, Mathematical and Engineering Sciences; through the President's Council of Advisors on Science and Technology; and through other mechanisms -- to help identify those areas of research that offer particular scientific promise, and thus would merit increased funding in future-year budgets. One such area, high performance computing, has already been so identified by FCCSET: the President's FY 1991 budget requests substantial increases (up 10 percent, to $48 million) for related research in the Applied Mathematical Sciences Program within BES.

General Science and Research

The fundamental sciences supported through the General Science and Research budget are Nuclear Physics, High Energy Physics, and the Superconducting Super Collider Project.

The DOE **Nuclear Physics** Program provides over 80 percent of the overall funding, including facilities, and supports approximately one-half of the university-based research, in this discipline in the U. S. The Program operates major user facilities at six laboratories, as well as several recently upgraded university laboratory accelerators. Apart from construction, the funding proposed by the President for this Program represents an increase of 11 percent ($24 million) to be used to offset increased operating costs of several national user facilities, to fund increased levels of activity in high-priority subareas, and for new instrumentation.

An increase of $17 million is requested for construction projects in the FY 1991 Nuclear Physics Program budget. This increase provides for the continued construction of the Continuous Electron Beam Accelerator Facility (CEBAF, $65 million) on schedule. When completed in 1993, this electron accelerator will provide beams with energies up to 4 GeV for precision investigations of the relationships between quark-based and nucleon-based phenomena in nuclei. The construction of CEBAF was initiated in 1987 following its identification by the DOE/NSF Nuclear Science Advisory Committee (NSAC) as the highest-priority project for the field.

Another Investment for the Future in the President's budget is the $15 million request to initiate construction of the Relativistic Heavy Ion Collider (RHIC). The accelerator, to be built in existing tunnels at the Brookhaven National Laboratory, will be a unique facility for the production and study of a form of matter -- the quark-gluon plasma -- that existed briefly in the early moments of the universe. This project, costing $397 million, was identified in the NSAC Long Range Plan of 1990 as its highest-priority new construction project for nuclear physics.

I should note at this point that the nuclear and high energy physics communities have a long tradition of reaching consensus decisions to build new facilities to replace existing ones that no longer provided access to forefront research. Accelerators whose capabilities were no longer competitive were either upgraded (in a few cases), decommissioned, or turned to other uses by other research disciplines. Their operations were no longer funded by nuclear physics or high energy physics budgets. My point is that construction of new facilities represents building for the future rather than propagating the past: good scientists have little interest in the latter. It is for this reason that I believe we should proceed with RHIC and with the SSC, and in this context that I would ask you to understand the Administration's policy that new construction -- the SSC -- should not interfere with the conduct of research in other areas.

The DOE High Energy Physics Program supports research groups at more than 100 universities and at 11 DOE laboratories. The Program provides over 90 percent of the overall funding for high energy physics in the U. S. and supports approximately 70 percent of the university-based research. In the President's budget for FY 1991, DOE funding for high energy physics research will increase by about 7 percent to $140 million. The Program operates three national accelerator centers, each of which provides particular research capabilities that are unmatched worldwide. The Administration's FY 1991 budget increases the funding for facility operations to $279 million (up 7 percent) and provides $12 million toward construction of a $23 million upgrade of the Fermilab linac injector. Major recently completed upgrades at the Stanford Linear Collider and at the Fermilab Tevatron Collider are now in operation. The accumulator/booster ring being constructed at the Brookhaven Alternating Gradient Synchrotron is scheduled for commissioning in FY 1991. These facilities will keep the U. S. program highly competitive for the next several years, while the SSC project (discussed below) moves forward.

The **Superconducting Super Collider** is the essential tool required for the next major step toward unlocking the fundamental secrets of matter and energy. When completed it will be the world's preeminent facility for high energy physics research well into the next century. The scientific need for a major step in energy into the multi-TeV range began to emerge in the early 1980s, and by 1983 the High Energy Physics Advisory Committee (HEPAP) was recommending "the immediate initiation of a multi-TeV, high-luminosity proton-proton collider project...."

Research in particle physics over the last twenty years, or so, has resulted in what I consider to be an historic advance -- we have developed a theory that unifies the electromagnetic and the weak forces of nature. This theory successfully predicted the masses of the W and the Z particles, and provides quantitative agreement with a host of previously observed phenomena. The reason it took so long to achieve this unification is that the weak and the electromagnetic forces have very different manifestations at the energies we encounter in everyday experiments, and this masked the underlying symmetry the two forces. Now the question is, what causes the underlying symmetry to be broken? The SSC should provide us with definite clues to this fundamental mystery and to the related question of the origin of the masses of the known particles.

In March 1986 the SSC design group settled on 20 TeV per beam as the appropriate energy for the machine to investigate these questions and evolved a site-independent conceptual design for the collider that would cost $5.9 billion. After the selection of the Ellis County, Texas site for the proposed SSC Laboratory, detailed design studies incorporating new information from the magnet development program for the HERA accelerator under construction in Germany led the SSC Laboratory to conclude that the accelerator would not reach 20 TeV unless significant design changes were made. Specifically, the Laboratory proposed increasing the aperture of the main-ring superconducting dipoles from 4 cm to 5 cm, and increasing the injection energy from 1 TeV to 2 TeV, and estimated the cost of the project at $7.8 billion.

Early this year, a HEPAP subpanel chaired by Professor Drell confirmed the critical importance of achieving the initial energy design goal of 20 TeV, concluding "If the beam energy drops appreciably below 20 TeV, one cannot guarantee sensitivity to these important new phenomena and, therefore, encounters the serious risk that the SSC might fail to deliver on its promise to elucidate the nature of electroweak symmetry breaking." The subpanel also concurred with the SSC Laboratory's proposal to modify the magnet aperture and injection energy to achieve this goal.

The President's budget for FY 1991 continues the SSC project forward with a request for $318 million. This is an increase of nearly $100 million over the FY 1990 level and it provides funding to proceed expeditiously with this project. The work will be focussed particularly on the critical issue of the 5 cm superconducting dipole magnets. I have said on the occasion of other Congressional Hearings that I view the successful fabrication, first of full size prototype magnets, and then of the industrialization of the magnet construction program as critically important milestones for the project. There is really no question in my mind that the magnets can be made to work. The important and more difficult task will be to develop manufacturing techniques for the mass production of magnets with the requisite combination of throughput and quality control. Here, too, I have faith in our industry.

The Superconducting Super Collider has enormous scientific merit. It will be critical to unraveling the fundamental mystery of the origin of the masses of the known particles. We in the Administration are committed to making this project a great success, and we propose to do so while assuring strong support for individual scientists' research in this and other areas of science. The SSC is a critical part of the Administration's initiative to strengthen America's position as a world leader in science and technology.

I will be happy to answer your questions.

Senator **Ford**. Thank you, Dr. Bromley.

We have been joined by two distinguished colleagues, and they may have an opening statement.

Senator Bumpers, do you have an opening statement?

Senator **Bumpers**. I do not. Thank you.

Senator **Ford**. Senator Burns.

Senator **Burns**. Mr. Chairman, I do not. Thank you.

Senator **Ford**. Thank you both for being here today.

Dr. Bromley, I have a couple of questions. And when we depend on those in the scientific community to give us some facts and to advise us and to carry out that advice and counsel, it takes money. And that is where we come in.

So let me ask you a couple of questions along that line. Are you concerned that the SSC may end up taking resources away from other areas of physics research supported by DOE?

Dr. **Bromley**. That is a perfectly reasonable worry, Mr. Ford. But I am convinced that, first of all, the proviso that was in the series of approvals as we have gone forward, that it not be built at the expense of the underlying program, is being taken very seriously by DOE.

I have talked with Admiral Watkins specifically on this point. I have, with him, looked at the out-year projections of the DOE budget and have been assured that in fact the intent of DOE in all its planning is to build SSC without cutting into the underlying program.

I would, of course, qualify that by noting, as I am sure we agree, that as the SSC program advances toward completion, there will clearly be a need to phase down some of the existing facilities as activity shifts to the SSC. Within high energy physics itself, I fully anticipate that there will be a shift of activities from other facilities to SSC.

But I am assured by the leadership in DOE. I believe those assurances that the SSC can be built without cutting into the remaining program.

And if I could add one other point, Mr. Chairman. I feel very strongly that we as a Nation do not invest adequately in research and development as an investment in our national future. Therefore, I believe that we are not playing a zero sum game here, despite the great difficulty that I recognize we face in the years ahead, given our deficit situation, and given the other very important demands on our budgets.

Senator **Ford**. Well, Doctor, it was everyone's impression, I think, and everyone is probably too broad, that the $5.9 billion cost for the SSC was a solid number, and I underscore solid number, at the time we in the Congress authorized construction last year.

Now the new estimate of $8 billion is based on new information about costs and new experience with accelerator magnets, as you so detailed. And such a big increase, so soon, of $2 billion has many people concerned.

How do you assess the probability that new information may come along to cause another big cost increase?

Dr. **Bromley**. I think that Senator Johnston made an excellent point earlier. I would return to it. And that is—well, let me first of all give you a short answer. And the short answer is, I believe that we do not need to look forward to continuing escalation.

Let me explain why I believe that to be the case. First of all, the $5.9 billion figure was based on the conceptual design study. Now I think all of us who have been involved, as I have for some 40 years in experimental science, know that in a conceptual design there is always a certain element of optimism in the estimating that goes with it.

But the fact is that once the real professional team whose reputations will be on the line—the team that is going to build the facility and is going to make their reputations on the line that it will work as promised—there is always a greater degree of conservatism.

And so I think none of us should have been surprised that when you move from the conceptual design study—I quite agree that perhaps people were not as open as they might have been, but there really were basis for understanding that that was a conceptual design figure.

Now that we have the actual professional group on site, it is going to go up. Now the question is, how much? I do not know what the number is yet. And I agree with Admiral Watkins that it is crucially important that the number, whatever it is, between 1 and 2 billion, should be scrubbed, as it is now being scrubbed by two quite independent groups, before the Admiral brings you and your colleagues in the Congress what he believes to be the cost estimate.

And I would submit, sir, that we cannot have a cost overrun until we know what the cost really is supposed to be. That is what the Admiral is committed to bringing to you.

Now why do I think that there is not going to be an additional set of changes? Well, because, for the first time, sir, this accelerator will be built in a different way. Past accelerators have all been built by physicists like me. And physicists, you may have gathered, have a tendency to be a trifle arrogant at times.

Senator FORD. And if I might make a statement, they do not give a damn about money. [Laughter.]

Dr. BROMLEY. We also have a tendency to have a continued stream of bright ideas. And there has been a great tendency to come in and say, my God, I have just discovered how to make a small improvement here. And, as I have mentioned to other committees, you know in dealing with an architect what happens when you come in and want to add just another room.

Senator FORD. Yes, but he is a political appointment. That is the reason.

Dr. BROMLEY. Well, the reason I have confidence this time, Mr. Chairman, is that we physicists are not going to be in charge of the construction. The Department of Energy has announced its selection of the industrial group led by Parsons Brinckerhoff that has major experience in bringing together very large international-scale projects.

They will be running the show. And it will not be possible for us physicists, no matter how ingenious our new ideas are, to come in and get change orders that in the past have racked the price up step by step. So it is for that reason—first, because the Admiral is taking the care to truly scrub these estimates that are now in his hands, and second, because the construction will be done in a different way from prior accelerators, and will be under the control of people who have a track record for bringing projects in on budget.

Senator **Ford**. Doctor, is there a cost level that would cause you to reconsider the project?

Dr. **Bromley**. Certainly, sir, at some point there is a cost level which I think would make me want to consider it. And I am quite sure there is a cost at which you would wish to consider it. But, frankly, at this point, I could not give you a specific number on this, because I am waiting, as I know you are, to see what emerges from the professional scrubbing of the estimates.

Senator **Ford**. Well, Doctor, if we get another shocker, it was $2 billion, and then after you scrub it, you come in with another increase, I think there is going to be cause for concern.

Dr. **Bromley**. I would share that concern.

Senator **Ford**. Does it trouble you what our congressmen stated earlier, that House bill 4380 may be passed, and that puts a limit on what we can put into it?

Dr. **Bromley**. The administration supports House bill 4380 with certain suggested amendments to that legislation. The suggested amendments are three in number.

First, we would wish to see some difference in the magnet test procedure from that specified in 4380.

Secondly, we would like to see the dealings with foreign collaborators formulated in such a way as to be consistent with the broad administration policies for nondiscriminatory trade and investment in these bilateral and multilateral agreements.

And, thirdly, the administration would recommend deletion of the provision that would refund the contribution of the State of Texas were the project for some reason to be terminated.

But, apart from those three suggestions, the administration would support H.R. 4380.

I may say, Mr. Chairman, and now I speak as an individual, that individually I have been on record before you and before other members of the Senate and the House as being concerned that the change suggested, where we are talking about 10 prototype magnets assembled by industry, does not give me the same degree of confidence as would a string of magnets that were produced by industry.

There is, I think, a significant difference between those two. But that is a personal comment.

Senator **Ford**. I have taken enough time. And I will pass it on. I have some other questions, but I will give those to you in writing, Doctor.

Senator Johnston.

The **Chairman**. Thank you, Senator Ford.

Dr. Bromley, I think it is important that we establish here, why the increase. I think some of my colleagues may think that this is the usual cost overrun, where doing that which was projected simply costs more. Actually, there has been a redesign here from 4 to 5 centimeters on the apparature which is a scientific requirement by experience at Tevatron and elsewhere. So that this is not an increase in the cost of doing the same thing, it is the desire to do something different.

And, now, your degree of confidence in those specifications is rather high. Is it not?

Dr. BROMLEY. It is very high.

The CHAIRMAN. I mean, this is not the same thing as our degree of confidence in break-even point on fusion, for example. This is much higher than that degree of confidence.

Dr. BROMLEY. I wish that my confidence in the fusion situation were as high as in this case, sir.

The CHAIRMAN. So that you doubt very seriously that there would be other design changes as we go along in this matter?

Dr. BROMLEY. I am very confident because I have a very high opinion of the team that has been assembled in Texas, that having now had the opportunity to take the conceptual design study to rework it in detail, to examine it in detail, that this is the end of the major changes of the kind we have been discussing.

The CHAIRMAN. Now, Dr. Bromley, to me the question is not whether the bill is precisely $5.9 billion or $7 billion or $8 billion or whatever it is. The more important question is, do we need a 20 TeV machine? Can it do more than Tevatron? Tevatron is about one TeV?

Dr. BROMLEY. Two.

The CHAIRMAN. And CERN is going to build——

Dr. BROMLEY. It could get to eight TeV.

The CHAIRMAN. Now, what will we be able to do that they cannot do, and why is it important?

Dr. BROMLEY. As Professor Drell's panel pointed out in an eloquent fashion, if the energy that we have available to us drops significantly below 20 TeV, we stand a very real chance of missing the real prize that we are after here—the origin of mass.

If we drop down to the eight TeV, for example, that the large hadron collider could provide, there is a very real chance that we would simply have made this investment and that the most important discovery that lies out there would have alluded us. To me, this is not a good investment.

If you have a strong indication before you begin of where pay dirt lies, you do not develop your plan of attack to fall just short of that pay dirt.

The CHAIRMAN. And the origin of mass being, is that the Grand Unification Theory?

Dr. BROMLEY. Well, there are two possibilities, sir. One is that there exists in nature something called the Higgs boson, which has never been discovered as yet, but associated with that would be something called the Higgs field. And the Higgs field interacts with all the particles of nature to give them their mass.

That is one possibility. But theoretical physicists are, if nothing, ingenious. So they have recognized that there is always the possibility that mother nature chose not to make a Higgs boson. If there is not a Higgs boson, then we have an alternate theory, supersymmetry. And supersymmetry can also explain the origin of mass. But the marvelous thing about the Superconducting Super Collider, with its design energy at 20 TeV, is that it can tell us one way or the other.

So we are as close as we can be, guaranteed to hit pay dirt, even if we may not know exactly what the character of that pay dirt is going to be.

The CHAIRMAN. So that in plain terms, we need the 20 TeV machine, this big machine, to get to the origins of the universe, the origins of mass. And they are not likely to be able to do that at CERN or at Tevatron or SLAC or wherever?

Dr. BROMLEY. All of our indications available at the moment, sir, suggest to us that we need something very close to 20 TeV to get into the range where these discoveries become probable.

The CHAIRMAN. Now, Dr. Bromley, you speak of the manufacturing techniques. Tell me about what we might be able to do as a country with manufacturing technology on superconducting magnets, why that is important?

Dr. BROMLEY. We have, as a matter of fact, sir, from the very beginning of superconducting technology taken a very leading role, and much of that has been stimulated by the desire to use superconductors in high energy particle physics. This has gone back for a couple of decades, long before the discovery of high-temperature superconductivity or popular interest in superconductivity.

Those magnets that were designed originally for use by particle physicists in their accelerators are now the kind of magnets, for example, that are being used in the magnetic resonance imaging facilities in hospital after hospital—one of the most powerful non-invasive diagnostic tools ever invented for human medicine. So we have been at the forefront of those developments.

In recent years, however, because of the demand for these magnets and because of the great flurry of interest in superconductivity, we have seen our colleagues in Italy, Germany, Japan put perhaps more of their resources into the development of manufacturing technology than have we. And so, although we still have people in our national laboratories who are world leaders in the application and use of superconducting technology, the manufacturing experience that is available today is no longer as uniquely centered in the United States. And, as was stated earlier, we have things that we can learn from the Japanese and from the Europeans in terms of the specifics of manufacturing. But you ask, I think, the right question, and that is, why is it important for us to have a domestic technology that we understand, and control? After all, know-how is our important edge these days.

But I think it is terribly important. Because I think, again, that superconductivity is one of those generic technologies whose applications we have just begun to appreciate. And I think it is very important for us to have a domestic manufacturing know-how here that is perhaps stimulated by the need to have these magnets for the Superconducting Super Collider. And I think we will have vastly greater applications in the future, applications that we cannot even imagine.

I can imagine a few of them. Obviously, one of the fields where we are putting substantial money into in the 1991 budget, if you agree, is Maglev—the use of superconducting magnets in magnetically levitated transportation vehicles. The use of superconducting magnets in the medical imaging field is already well established.

One of the very important areas, I think, sir, where we have the possibility of major industrial utilization, is in a well-developed field of the generation and utilization of large blocks of electrical energy. We tend to think of our generators and motors as being really remarkably efficient. They are in the high 90 percents. But the technology is possible.

We could use superconductivity to raise those efficiencies much closer to 100 percent. And with the whole question of environmental impact staring us in the face, one of the most important initiatives we have in this country is that of reducing our combustion of fossil fuels. If we can use electrical energy more efficiently, if we can transmit it more efficiently, all of those technologies depending upon superconductivity will benefit and benefit markedly.

So all of these lead me to agree with you entirely, sir, that it is important for us in this country to develop a domestic expertise in this field. This is one way in which we can develop that expertise.

The CHAIRMAN. Now, H.R. 4380, which I understand the Administration supports, makes a requirement for foreign participation to the extent of what, is it a billion dollars?

Dr. BROMLEY. One third. One third of total costs from non-Federal. And if one subtracts the $1 billion from Texas, then the remainder would presumably be from foreign sources or from some creative fund-raising vehicle that was non-Federal in this country.

The CHAIRMAN. Now, that is likely to be the high technology part. They are not going to put up money to buy the land or to dig the ditch. It is likely to be the high technology, is it not?

Dr. BROMLEY. I think that it is true that most of our foreign participants will be interested in learning as much as they can from this project.

The CHAIRMAN. Now, Dr. Bromley, is it fair to say that the administration support for H.R. 4380, particularly the foreign participation parts of it, driven is more by the desire to get a SSC than by the particular foreign participation provisions? In other words, the Administration wants this project and is willing to do it under the strictures as imposed by the House. Those strictures about—those provisions about foreign participation were not really Administration-imposed. Is that fair?

Dr. BROMLEY. I would not completely agree, sir. The Administration feels very strongly that with large projects of all sorts, not just SSC, we are reaching the stage where foreign participation—not just in the utilization but all the way through the project from conceptualization through design, construction and utilization. So this is a more fundamental desire on the part of the Administration to make sure that we do get as much foreign participation as we can. It is not specific to SSC, but I think, having said that, that I am very appreciative of the issue you raise about the desirability of our not losing know-how.

The CHAIRMAN. Well, how about fusion? Should we require foreign participation in fusion?

Dr. BROMLEY. We are, in fact, heavily involved, Senator Johnston, as you know in the ITER project. We share on an equal basis with Japan, with the Soviet Union, and with Western Europe the support of that project, which promises to be one of the very effective frontier projects in the whole international fusion program.

The **Chairman**. Suppose we cannot get foreign participation. Is this project worth our doing?

Dr. **Bromley**. I believe it is worth doing because, as I have said from the very beginning, it is the most magnificent scientific instrument that has yet been conceived by our species. I look to it not just because it is going to give us the secrets of mass and of the universe but also, I hope, because it has a more important function. It has an important function in demonstrating to our own people and to the world that we still are capable of working successfully on the very frontiers of technology, and I hope that it will also provide a stimulus to bring many more of our young people into careers in science and engineering and technology.

The **Chairman**. Is there any real hope that one third of the cost of this would be put up by foreign sources?

Mr. **Bromley**. I believe that there is. Not one third by foreign sources, but one third by non-Federal sources. If one takes the——

The **Chairman**. Includes Texas.

Dr. **Bromley**. Take the Texan commitment and then ask is it conceivable that we could get the remainder of one third of the total with the presently estimated total from foreign sources——

The **Chairman**. And half the magnets?

Dr. **Bromley**. I would say that in terms of total commitment, yes, it is feasible.

The **Chairman**. Well, that is about $1 billion.

Dr. **Bromley**. Yes.

The **Chairman**. Or roughly half the magnets.

Dr. **Bromley**. Or perhaps—yes.

The **Chairman**. And could we get them to do anything except the high tech part of it? I mean, you have just identified the importance of magnet technology.

Dr. **Bromley**. That is right.

The **Chairman**. Manufacturing technology, and so we give away or we get our foreign participation from the most important part. Why cannot we get it elsewhere? I mean, you talk about foreign participation from the start right with the design and all the way through, and that sounds like a good idea. Why not foreign participation in digging ditches?

Dr. **Bromley**. Well, frankly, at this point, sir, it is too late for us to do that with SSC because our foreign collaborators are proud individuals and if they feel that they were not involved at the conception, they are not about to come dig our ditches for us.

And so I think there is no question that they will want to be involved in some of the high technology, but I do not think that that is necessarily the dominant feature. For example, the only country that is already committed are the Indians, and the Indians are prepared, I think, to do just about anything that will fit into a reasonable collaborative program. I am sure that the Canadians, whom I would expect to join us in this, would not insist on a particular area of performance. I think what we really are faced with is the need, when Deputy Secretary Moore and his party heads off at the end of May to negotiate foreign participation, that we have to be rather tough in our negotiating stance, because we are making available a very major facility that would make it unnecessary for other countries to invest themselves, and they are not doing this out of altruism. They are doing it because they want access to this facility when it is finally functioning.

And so we can negotiate just under what conditions that access will be made available. I do not think we have to give away what we feel is in our own best interests to retain.

The Chairman. Well, I hope that the Deputy Secretary will go to the negotiations with that in mind because it seems to me that we should not be giving away the most valuable part of that technology. Thank you, Mr. Chairman.

Senator Ford. Thank you, Mr. Chairman.

Senator Bumpers.

Senator Bumpers. Mr. Chairman, thank you very much.

Dr. Bromley, I am not an enthusiastic supporter of this project, and that is the voice of a layman, number one, who does not understand it and, number two, the voice of a fiscal conservative who wonders whether or not we can afford it. But while I understand—and I have had physicists in my office who have tried diligently to put through this thick skull precisely what it is we are going after—I still do not fully understand it.

But more than that, I want to ask you what do we get? If we discover the nature of mass today, what are the benefits from that? I know there is a lot of intellectual curiosity, which I fully appreciate.

Dr. Bromley. It is not possible for me—when you start dealing with truly fundamental research of this kind, the most fundamental known to us—it is simply not possible for me to specify for you the immediate benefits. What I would have to do is to fall back, first of all, on the history aspect, which shows that every new discovery of this kind that we have ever made has in surprising fashion and in a surprisingly short time turned out to have the most real of applications. For example, the one that I just mentioned in my remarks.

Senator Bumpers. The magnets?

Dr. Bromley. When I talked about positron emission tomography. Positron emitters were discovered in the old crude cyclotrons when I was a youngster, and we had great fun playing with them because they were a particular new kind of radioactivity. No one had the slightest idea that if you had come to me and asked me why do you not, Dr. Bromley, come up with a device which will allow us without any penetration of the human person whatever to tell us in real time exactly what that individual's brain is doing, which part of his brain is functioning when he reads, when he listens to music, when he speaks, when he moves his arms, I would certainly not have been apt to go out and build a cyclotron. But that, sir, is exactly what happened. We learned how to make positron-emitting radioactivity, which is now fed to patients in small amounts. That radioactivity is carried by the biochemistry, human biochemistry, to the brain. By labeling sugars, for example, with that radioactivity, the brain cells that are most active at any moment are burning that sugar and are attracting more into themselves so that they can continue to function. So when you, for example, are reading, a particular part of your brain is burning sugar at a high rate. And here is this machine that was invented by a bunch of physicists, who were playing around with a cyclotron because they were curious, that tells you that this precisely is the part of the brain that is functioning, and if it is not functioning you have big problems and perhaps we can tell you why, and we can identify abnormalities. We can probe so that a surgeon knows to within fractions of a millimeter where he has to go to make corrections. This is the kind of thing that comes from this kind of research.

But I cannot promise any particular example. And I would have to say, sir, that this, again, is the sort of thing that is on the absolute frontier of human knowledge, and there is nothing more on the frontier than what the SSC can and will do. And it is part of our human nature, I think, to go after it because it is there.

Senator BUMPERS. Well, it is very exotic and very interesting, but you know, one of the choices we have to make here in the Congress is—for example, let us take the space program, nobody would turn the clock back on the space program. I would turn it back on SDI. But in each of those instances, we obviously get a lot of technical fallout, a lot of scientific knowledge.

Dr. BROMLEY. Yes.

Senator BUMPERS. But we have to decide, would we have been better off to have sought that knowledge specifically at a much reduced cost other than going after this big global picture where we get these things as a sort of a fallout?

And in this particular case, you have got the CERN project in Switzerland. Did you read the big feature story in this week's Time Magazine on that?

Dr. BROMLEY. Yes.

Senator BUMPERS. Now you have suggested that that is simply not big enough to get the right answer or the ultimate answer that we want. But let me go back to the cost thing and compare what we are about to undertake with the CERN project.

What if the CERN project, which is way ahead of us, what if they do discover, for example, enough information that shows us we are either on the wrong track, or that a tremendous portion of our investment has been wasted, and that we are going to have to do an additional redesign just as we have come up with an additional $2 billion right now? Is that a possibility?

Dr. BROMLEY. One can never rule out that something of this kind could conceivably happen. But I would say that on the basis of the assembled wisdom of all the world's best and most able physicists, the probability of that happening has been judged to be very small. And we are making this investment, we are recommending this investment to you.

Obviously, we would not recommend it to you if we felt that there was any significant probability of it being beside the point, of it being too late, or if the Europeans could in fact achieve what we are trying to achieve with their facility.

I do not believe that they can. I do not believe that they have sufficient energy. And I would suggest that you ask the same question of Professor Drell, who is an expert in this particular field, when his panel comes before you.

Senator BUMPERS. I think he was one of the physicists in my office, and I have already asked him the question. [Laughter.]

I have a high degree of confidence in you and Professor Drell, so far as science is concerned. I am not sure I have that high a degree of confidence in your fiscal prowess as to what this thing ought to cost.

Dr. **Bromley**. You would be singularly unwise if you did.

Senator **Bumpers**. But you have expressed, and I think in a rather dangerous way, frankly, your high degree of confidence that this is the ultimate design, and that it will work. And, as I say, I think that is rather dangerous, because we got that same high degree of confidence expressed in this same room a year ago. And now we are, one year later, $2 billion above that figure.

Dr. **Bromley**. Well, if I may, Senator. I would not for a moment contradict the statement that you may have gotten exactly the same statement, but I do submit to you, sir, that the conditions were different. You were dealing then with a conceptual design figure, and I understand fully that when people are attempting to sell a project that particular fact is not overly emphasized. But it is nonetheless the fact.

We are not dealing with a conceptual design figure now.

Senator **Bumpers**. Well, I have been a big supporter of the B-2 bomber until the last year. And we heard those stories over and over again about how this was the ultimate in penetrating technology. And now we have developed a problem that has nothing to do with penetrability, it is cracks in the tail. Because they are using a new kind of material that we have never used before.

And as I say, one of the things that perplexes me or concerns me about this is the kind of sense of urgency that you and others are expressing. Two weeks ago tomorrow, our national debt soared past $3 trillion. That is only a 200 percent increase since 1980.

And my concern here is that I think the CERN project might be worth watching for a little while longer. And I am concerned about these costs going up in light of our responsibility to deal with the deficits in a fiscally responsible way.

And third, I question whether or not there is the kind of urgency about this particular scientific knowledge—maybe not nearly as much urgency as there is in other things. And I do not want to get preachy about this, Dr. Bromley, but we have got the supplemental appropriations bill coming up this week, and I am having one hell of a time trying to find $23 million to get people in this country a second measles shot. I have $12 million for the outbreak of measles. We have 25 kids dead in Los Angeles from measles in the last 60 days, and I will have a terrible time trying to come up with that money.

One reason is, because in order to get that $23 million, I have already located the $12, in order to get this money, I have got to take it away from somebody else. The people who want Panama and Nicaragua to have $400 million each do not want to give up $23 million of that even to save children's lives in Los Angeles.

Let me ask you another question. The other thing we have to do here is to establish priorities when you are dealing with a limited amount of money, and this kind of research is very expensive.

Dr. **Bromley**. Yes, sir.

Senator **Bumpers**. How would you compare your own enthusiasm for this compared to the space station?

Dr. BROMLEY. I think that it would be improper for me, sir, to give you my personal view on that. And the reason for that, sir, is because I had an opportunity to sit down with Richard Darman, with the President, with Admiral Truly, with Admiral Watkins, independently, and we argued the relative merits of these and other major projects, and the President then made the decision.

These are presidential decisions. And as a member of the President's team, once he has made that decision it is my function to make sure that the decision is implemented in the most cost-effective and efficient way that I can.

Senator BUMPERS. Well, you know the President wants it all.

Dr. BROMLEY. Not all, sir.

Senator BUMPERS. No?

Dr. BROMLEY. No. There were many things that fell by the way.

Senator BUMPERS. I am not sure he even wants this. He has not told us how he wants to pay for it. He said, you fellows figure this out. And in his joint session, State of the Union address, he says I am happy to report the budget deficit is under control.

And next year the deficit will be $64 billion—next year the deficit will be $164 billion. It is wildly out of control. And yet we are asked, as members of this body who have to go home and report to our constituents every weekend, as I do at least, why are we are so fiscally irresponsible here? And nobody has told me, and I have got a staff memo here by the subcommittee staff, who say they do not know of any way the President proposes to finance this thing.

Dr. BROMLEY. Sir, I can only say that from my own point of view, and I believe it is the President's point of view, we are bringing this forward to you because we believe that we have, to the best of our ability, in the budget that was brought to you this year, balanced, on the one hand, the support of the ongoing applied work that we expect to have short-term payoff and, on the other hand, investment in the far distant future. This is one of those investments.

And we believe that unless we maintain that balance, and unless we can keep the facilities coming—so that our children are going to have the same kind of support to get to the frontiers of nature that our forefathers gave us do our research—then we will have lost a leadership that was hard won and that we still maintain in the world.

We have the strongest science and technology enterprise that the planet has ever seen. And it has been built through your efforts, gentlemen, working with the scientific community. We are the only developed nation in the world where scientific programs are built from the bottom up on the enthusiasm, the insight, the drive of groups of scientists who, coming together, decide that this is the most exciting and important thing we can do.

Now, some of those people work on the very frontiers of our knowledge, where is it too early yet to tell you exactly what the return is. But let me tell you, sir, that just recently Edwin Mansfield of the University of Pennsylvania, one of the Nation's most distinguished economists, asked this question: what is the return on investment in this research?

His paper, which is just coming out, looks at 76 companies in seven different areas—chemicals, automotive, electronics, and so on—and goes back 15 years and says, what is the rate of return on the investments that have been made in the basic research at universities that have led to the new developments, the new products, the new techniques, the new services? And the answer is 28 percent. That is the number that a certified economist, of which I am certainly not one, came up with.

I think that is a good number. Because that is not a bad rate of return. And so, to the extent that retrospectively one can give a number, that is the number. Prospectively, I would find it impossible to give that number. But I think history is a reasonable guide.

Senator **Bumpers**. Dr. Bromley, let me say, personally, I have the utmost respect for you as a scientist and as a man of intense integrity. And certainly my questioning is not designed to badger you, it is just to raise probably rather simple questions by a layman.

Dr. **Bromley**. I understand, sir.

Senator **Bumpers**. Everything has to be put in priority around here. My disagreements with your president and not personal, they are simply based on priorities. And something like 68 percent of the basic research money in this country that the United States Government spends, as you know, is coming out of the Defense Department.

Dr. **Bromley**. That is correct.

Senator **Bumpers**. And I do not think——

Dr. **Bromley**. Sixty-one now, sir.

Senator **Bumpers**. Sixty-one. And the Japanese spend about 2 percent on basic research on defense. And the Germans slightly more than that.

Dr. **Bromley**. If I may, sir. Of that 61 percent, it is worth emphasizing that 92 percent of that total is tied to specific weapon systems. Only 8 percent would fit under the same rubric that is used elsewhere in the government in discussing research and development.

Senator **Bumpers**. I understand those arguments. But when I sit on the health and human resources subcommittee of the appropriations committee, and NIH tells me that they have thousands of very good applications for basic medical research, and I know that we could easily put $2 billion more into NIH for that purpose, and the money is simply not available.

And you see, with me, that is really a much higher priority than the SSC is.

Thank you, Mr. Chairman.

Senator **Ford**. Thank you, Senator Bumpers.

Senator Burns.

Senator **Burns**. Dr. Bromley, if Senator Bumpers is a layman, I am the serf. Because I went through this with the State of Montana when we were making applications for this supercollidor, and know very little about it. And I would imagine that the scientific community could well take a lesson or some courses in salesmanship. People like Senator Bumpers and myself, we do not buy stuff, we buy benefits.

And sometimes we have to rationalize, if I could get the fervor that you have in your community into research over into agriculture and how we feed and clothe and protect the health of our citizens, so that agriculture and the medical community could make a living and still do it within the reach of every pocketbook in this country, why, if I could get that sort of a fever like yours has started, I am sure that we could solve a lot of our problems.

I have just got a couple of questions. I would like some kind of an indication how you are being received from our foreign sources of capital. Are they willing to make the investment in this project? Is their interest in this questioned, or is it higher than you would find on this committee?

Dr. **Bromley**. I can report to you on three specific countries. I was involved as chairman of the U.S. side of the Indo-U.S. bilateral that President Reagan set up, and specifically was involved in negotiating the $50 million that India wishes to contribute, and that is on the line. They have committed to that.

I do not pretend that I have formal commitments at all from the other countries, but I have talked with a number of senior officials and certainly with a number of senior scientists in Japan. And my reading of those discussions is that there is very real interest on the part of the Japanese in participating in a major way in SSC.

I have also talked with senior government officials and with senior scientists in Canada. I believe that there is very real interest on their part in participating in SSC. Those are the three that I can speak to from personal knowledge at this time, sir.

It is not just cocktail party discussion; this is serious discussion. And I anticipate that we will, as a result of the trip that I mentioned that Deputy Secretary Moore and his group will be making later this summer, see very concrete indication and commitment on their part.

Senator **Burns**. I have not talked to Deputy Secretary Moore about this situation. Is he confident that we can reach our goals of 30 percent financial support for this project?

Dr. **Bromley**. Thirty percent non-Federal, not 30 percent foreign.

Senator **Burns**. I am sorry, I did not clarify that.

Dr. **Bromley**. My understanding is that Mr. Moore is in fact reasonably confident of that. It is hard to know until he has the discussions. But every occasion on which I have talked to him about this suggests that he has very great confidence in his ability to do this.

Senator **Burns**. Well, that was just some things that I was concerned about. I could ask you no technical questions or even get anything close to them. And I think what it boils down to for most of us, is how we are going to pay for this thing and the benefits derived. And it sounds like the benefits are pretty hazy out there. But I also go back to the old -- like Senator Bumpers from Arkansas, and that these men served with him and -- and the old saying of Senator Dirksen, a billion here and a billion there, and pretty soon we are talking about real money.

Dr. **Bromley**. I would not argue with that, sir.

Senator **Burns**. And I think we better be very cautious of that. And thank you, Mr. Chairman. I appreciate the opportunity.

Senator **Ford**. Thank you, Senator Burns.

Doctor, let me ask one thing. I believe I have got a thread that you have one opinion that may be personal that is a little bit different from the administration's. But let me ask you this question, and this will be the final question, unless Senator Johnston has something. What condition should we have on magnet production and testing before going on with construction?

Dr. **Bromley**. Sir, I have to answer that question in two parts. I am on the record before you and before other committees of this Senate in the past—and I stand by that as a personal statement. I believe that it would be important in my view, to give me the confidence that I feel that it would be important to have, to have some significant number—I do not know, pick 25 out of the hat—25 magnets that have been produced totally by an industrial supplier in their own factory; and have those magnets demonstrated to be reproducible, reliable, and industrially produced.

I still believe that that is a very important requirement.

The Administration's position is different. It is that we require 10 magnets that would be industrially assembled. And the difference there, sir, is that the magnet components in this case would be fabricated in a national laboratory, Fermilab in particular, by a group with a large sprinkling of Ph.D.s.

And I have been sufficiently experienced in my pre-Washington days to know that until an industry actually begins to fabricate something in their own factory, there are strange things that can happen that cannot be foreseen in total.

So I am a little uncomfortable about proceeding to other aspects of the program, particularly given the history of the Colliding Beam Accelerator on Long Island, until such time as we have demonstrated that an industrial supplier—remember that we are going to need more than 10,000 of these magnets, sir—I would like to see enough of them produced reliably, reproducibly, and industrially to demonstrate that we in fact can make this very critical component and do it correctly.

I do not believe that this would in any sense hold up the program. And I further believe, and have testified before you, that the $318 million that the Department of Energy has requested for fiscal year 1991 indeed would permit just this demonstration if in fact this funding were directed predominantly to that target.

The **Chairman**. Dr. Bromley, that number is a dozen, 20, 25?

Dr. **Bromley**. Some number that gives statistical—25 I picked out of the hat.

The **Chairman**. Well, why do not you give us a number, because that may end up in some legislation somewhere, so pick the right number? [Laughter.]

Senator **Ford**. Pick the right number.

Dr. **Bromley**. Twenty-five would make me reasonably happy.

The **Chairman**. Well, what is the phase one number? That was 10, was it not?

Dr. **Bromley**. It was 10. And that was 10 industrially assembled, not industrially produced. That is the difference.

The **Chairman**. Well, how many are there in phase two?

Dr. **Bromley**. I frankly do not know, sir. Someone I am sure here does, though. Dr. Decker.

The **Chairman**. Yes, there is someone in the back.

Voice. 1,027.

The **Chairman**. 1,027? But we do not need 1,027.

Dr. **Bromley**. No. If we could produce 25 and do it reproducibly and reliably, I think we would be in excellent shape.

The CHAIRMAN. All right. There is some question about whether there should be dual sourcing or sole sourcing on this. Do you have an opinion on that?

Dr. BROMLEY. I would not wish to—I do not have sufficient background or expertise to really comment usefully on that. I think that we have people here who will be speaking to you later who are much better qualified than I.

The CHAIRMAN. But you would use the figure of 25?

Dr. BROMLEY. Industrially, reproducibly, reliably produced.

The CHAIRMAN. Thank you very much.

Senator FORD. Thank you, Doctor. I am afraid we kept you a little longer than I had intended. But as you can understand, you are the spokesman and answered the questions. And we will be looking at you, I imagine, several times before this year is over.

Dr. BROMLEY. I welcome the opportunity to come back, sir.

Senator FORD. We look forward to it. Thank you very, very much.

Next panel witness will be Dr. Decker, Acting Director, Office of Energy and Research, Department of Energy; and Dr. Roy Schwitters, Director, SSC Laboratory, Dallas, Texas. Good to see both of you back, and you understand the conditions of the hearing, and you may highlight it.

And, Dr. Decker, you may go first.

STATEMENT OF DR. JAMES F. DECKER, ACTING DIRECTOR, OFFICE OF ENERGY RESEARCH, DEPARTMENT OF ENERGY

Dr. DECKER. Thank you, Mr. Chairman.

I have a written statement that I have submitted for the record. And I would like to briefly summarize it for you.

Senator FORD. It will be included in the record. Can you summarize that?

Dr. DECKER. I will do my best.

It is a pleasure for me to appear before you today to discuss the Department of Energy's fiscal year 1991 budget request for the programs in the Office of Energy Research. These programs include: High Energy Physics, the Superconducting Super Collider, Nuclear Physics, Basic Energy Sciences, Biological and Environmental Research, Magnetic Fuslor Energy, University and Science Education and the supporting programs. The total fiscal year 1991 budget request for these programs is $2.6 billion.

This request reflects the administration's strong belief in the key role played by science in our Nation's future, technological and economic well being. Dr. Bromley has already addressed this point. I would like to take the next few minutes to highlight some key aspects of the High Energy Physics research program for fiscal year 1991 and our progress on the Superconducting Super Collider.

The goal of high energy physics is to determine fundamental constituents of matter and the forces that hold them together. These are some of the most fundamental questions we can ask about what makes our universe work in all of its vast complexity.

At present, we have an incomplete model that we call the Standard Model that describes many of the observed phenomenon. During the past year, the Stanford Linear Accelerator Center and

Fermilab have measured certain key features of the so-called Standard Model. The measurements made at Stanford and Fermilab on the Z particle have confirmed a prediction in the Standard Model by setting limits on a number of different species of particles to be expected. The search at Fermilab for the ellusive top quark predicted by the Standard Model continues and a lower limit on its mass was established.

The higher energies required to continue this search are only available at Fermilab and nowhere else in the world at this time. The fiscal year 1991 budget request provides for full operation of our high energy physics facilities at Fermilab, at Stanford and at Brookhaven to fully exploit our investment in those facilities.

There are a number of important fundamental questions about the standard model that cannot be answered using present facilities here or abroad. For example, what is the origin of the mass of particles? Are there smaller more fundamental particles than quarks and leptons? Is there yet some undiscovered force? To reach the energies necessary to answer these and other questions, we need a more powerful tool than any available today. We need to build the Superconducting Super Collider.

In January 1989, we began creating the SSC Laboratory from a true green field start. One of the first tasks of this new laboratory has been a complete base line conceptual design for the Texas site. You may recall that the original conceptual design completed in 1986 was developed by a national design team located at the Lawrence Berkeley Laboratory.

The preliminary base-line design completed in January of this year contains two major technical design changes based on new information since the original 1986 design was completed. The injector, which sends protons into the main 54-mile ring, had to be enlarged to inject the protons at 2 instead of 1 trillion electron volts. And the magnet aperture had to be increased from 4 to 5 centimeters. But Dr. Bromley has already discussed the technical reasons for making those changes, so I will not repeat that. However, these technical design changes have led to significant increases in the estimated cost of the project.

There are some additional cost increases due to such things as updated estimates of such items as labor mix and rates. These increases have now raised the project cost to about $8 billion compared to the previous estimate of $5.9 billion. Because of the potential cost increases, I asked the SSC Laboratory to consider descoping the project.

The only form of descoping that could save substantial amounts of money is a reduction in size and, therefore, the energy of the accelerator. Because reduction in energy would impact the physics goals, I asked our High Energy Physics Advisory Panel to consider the physics research potential of the SSC as a function of the energy. To examine this issue a blue ribbon subpanel was formed. It was chaired by Dr. Sidney Drell, who you will hear in the next panel.

That panel included five nobel laureates. And as Dr. Bromley indicated in his testimony, the panel fully endorsed the proposed 20 TeV design and indicated to us that there was too much of a risk of losing important physics by reducing the energy. The panel also endorsed the proposed technical design changes that I mentioned earlier.

Given the potential cost increases, a status report on the project was given to the White House. The result of the ensuing discussion resulted in a reaffirmation of the administration's strong support for pursuing the Super Collider to achieve the original 20 TeV per beam goal.

Now, substantial progress has been made on the SSC project in the last few months. The Department has approved the laboratory's plan, geographical location of the collider ring and campus and has requested Texas to proceed with the land acquisition. Texas is also proceeding with issuing bonds and expects to have the first $250 million in hand by late May to early June. A memorandum of understanding with Texas is being developed, and we expect to complete it next month.

Also the architect engineering construction manager has been selected by the laboratory to design and construct the conventional facilities. Contract negotiations are now under way with the consortium of firms selected. And that negotiation should be completed, and we expect to award the contract later this summer.

Now with regard to foreign participation, the Department retains the goal of obtaining one-third of the project from non-federal sources. And, of course, that includes the $1 billion from the State of Texas. During the past year, the Department, working with other agencies, prepared a plan for seeking international contributions to the SSC. We certainly recognize the need to apprise the Congress of our international cost sharing strategy and have begun briefing members on this plan. An unclassified version of this plan has been prepared and is ready to be released. Deputy Secretary Henson Moore will lead a delegation on the first international visits seeking SSC participation in June.

Many of your written questions submitted to the department for the record focused on management issues. And, therefore, I would like to address some progress that we have made in that area. Last summer, a new management organization for the SSC was approved by the Secretary that is consistent with his objective of strong line management responsibility for his large projects.

Responsibility in the Department for the SSC is in the Office of Energy Research. The plan calls for an SSC program manager heading the Office of the SSC reporting directly to me. We have an acting program manager and candidates for the permanent program manager are being evaluated. And I expect a selection quite soon. A Department of Energy onsite office has been established in Texas with staffing for the office underway. This site office reports directly to the SSC office in headquarters.

I am pleased to announce that I have identified an outstanding project manager who has considerable experience in the Department of Defense and in the private sector to head this site office. I expect that he will be in place about May 21. The management of the project at the SSC Laboratory is also being strengthened. A search committee has been established to locate an individual with a proven track record in managing large projects to be the laboratory's project manager. The project manager will report to the laboratory director and have full responsibility for the project.

At the present time, the laboratory is continuing to refine its design and its associated cost and schedule estimates. The Department will then conduct two independent reviews of the laboratory's work, and we will have a new validated cost estimate this summer. A third independent review will be conducted by a subpanel of the High Energy Physics Advisory Panel. The subpanel members will be selected with appropriate experience in building large projects. As a result of these activities we expect to have a hard cost and schedule estimate in August of this year.

In fiscal year 1991, primary emphasis in the project will be on design and magnet development.

Now, there are many other important activities in the Department's fiscal year 1991 request for the Office of Energy Research, such as, the human genome initiative, climate change research, and operation and construction of scientific user facilities. Dr. Bromley has already touched on a number of these activities.

In the interest of time, I will not cover them in my oral remarks. They are described in my written testimony. This completes my remarks, and I would be happy to answer any questions.

[The prepared statement of Dr. Decker follows:]

Statement of James F. Decker
Acting Director
Office of Energy Research
Department of Energy
before the
Subcommitte on Energy Research and Development
of the
Senate Committe on Energy and Natural Resources
April 24, 1990

Mr. Chairman and Members of the Subcommittee:

It is a pleasure to appear here today to present the FY 1991 budget request for the programs supported by the Office of Energy Research (ER). These programs are: High Energy Physics, the Superconducting Super Collider, Nuclear Physics, Basic Energy Sciences, Magnetic Fusion Energy, Biological and Environmental Research, Energy Research Analyses, University and Science Education, University Research Instrumentation, Multiprogram Energy Laboratories-Facilities Support, and supporting program direction.

Funding for these programs in FY 1991 is being requested under the two appropriations shown in Table 1, Energy Supply R&D and General Science and Research. The total FY 1991 budget request for ER's programs is $2.7 billion, an increase of $302 million over the FY 1990 appropriation of $2.4 billion. In his February 7, 1990, testimony before the House Committee on Science, Space, and Technology, Dr. Allan Bromley, Director of the Office of Science and Technology Policy, noted that, "federal support for basic research is an essential investment in the nation's scientific and technological future." This request reflects the Administration's commitment to the key role played by science in enhancing the economic and technological well-being of the United States, as well as the quality of our lives. It also reflects our continuing commitment to excellence in the research programs supported by the Office of Energy Research. I would like to discuss the programs under the General Science and Research appropriation first, followed by those under the Energy Supply R&D appropriation.

Table 1
Office of Energy Research
Summary by Program
Budget Authority
($ in millions)

	FY 1989	FY 1990	FY 1991 Request
Energy Supply R&D			
Basic Energy Sciences	$ 534.3	$ 569.8	$ 648.7
Magnetic Fusion Energy	344.7	320.3	325.3
Biological & Environmental Research	250.8	308.7	338.8
Energy Research Analyses	3.8	3.8	3.7
University and Science Education	21.4	24.9	29.7
University Research Instrumentation	4.9	4.9	4.9
Multiprogram Energy Laboratories-Facilities Support	24.4	22.1	23.7
Advisory & Oversight Program Direction	3.3	3.3	4.3
Policy and Management	.7	.7	.9
Small Business Innovation Research	33.1	0	0
Subtotal	$1,221.4	$1,258.5	$1,380.0
General Science & Research			
High Energy Physics	$ 549.8	$ 582.1	$ 621.2
Superconducting Super Collider	98.1	218.6	317.9
Nuclear Physics	258.0	289.7	330.7
General Science Program Direction	2.6	3.0	3.9
Subtotal	$ 908.5	$1,093.4	$1,273.7
Total ER	$2,129.9	$2,351.9	$2,653.7

HIGH ENERGY PHYSICS

The long-standing goal of the High Energy Physics program is to improve our understanding of the nature of matter and energy and of the basic forces that govern the world in which we live. One of the major objectives of high energy physics research is to develop a unified description, or single theory, that would describe all the interactions of matter and energy in the universe. Another major objective is to search for the most fundamental constituents of matter. To continue to expand our knowledge in these areas, the program must develop advanced technologies that are used in the accelerators and detectors required to carry out high energy physics research.

Over the years, the program has contributed significantly to the development of advanced technology in many areas critical to the United States' economy, such as large-scale computing, high-speed electronics, and low temperature superconductivity. The instruments of high energy physics research and the knowledge gained from this basic research program have found practical applications in our every day world: in medicine for diagnosis and treatment of illness, in the food industry for sterilization, in construction for inspection of structural defects, in law enforcement for the analysis of evidence, in computers and computer science, and in the making of computer chips.

In recent years, high energy physicists have developed an increasingly better understanding of the forces of nature and the unifying connections among them. The four known fundamental forces are the electromagnetic force, the weak force, the strong force, and the gravitational force. The search for a unified, or single, theory has been a reliable guide to physics research. It is a search for linkages between apparently diverse phenomena in an effort to discover underlying simplicity. A part of the progress in high energy physics has been the conceptual unification of the weak nuclear force and electromagnetic force into a single "electroweak" framework. In addition, a theory of the strong force has emerged which is consistent with experimental results. There is increasing anticipation that the unification of the strong nuclear and the electroweak forces into one "grand unified" framework may be possible, thus reducing the apparent number of forces in nature to two. The ultimate goal is a "super-grand" unification that would bring all of the forces in nature into a single unified framework.

This picture of nature in terms of the electroweak and strong forces and a small set of fundamental constituents of all matter is known as the Standard Model. While the most significant recent experimental results all reinforce the predictions of the Standard Model, there are still unanswered fundamental questions. For instance, have we discovered the ultimate constituents of matter or are there smaller particles inside the families of particles called "leptons" and "quarks" which we currently believe are the fundamental particles? Do we know all the forces of nature? Are all these forces only a manifestation of a single force? How does gravity fit into the Standard Model?

The ability to carry out forefront, exploratory research in High Energy Physics, and to pursue the answers to these questions, requires large particle accelerators, colliding beam devices, and large particle detectors. In the U.S., DOE supports three accelerator centers: the Fermi National Accelerator Laboratory (Fermilab), the Stanford Linear Accelerator Center (SLAC), and the Alternating Gradient Synchrotron (AGS) at Brookhaven National Laboratory (BNL). Each of these laboratories provides world-unique capabilities and is operated as a national facility available to qualified experimenters from around the world on the basis of the scientific merits of their proposals. The talented physicists attracted by these facilities have continued to conduct landmark research, some of it earning Nobel Prizes for the researchers. To push back the frontiers to new knowledge in this field and to maintain this pioneering program into the next century, construction of the Superconducting Super Collider (SSC) is necessary. The SSC, which will be discussed later in this statement, will be the largest scientific instrument ever built and will be a beacon for new discovery, scientific training for our youth, and a source of new technology for many decades.

The physicists who are planning and developing experiments to be conducted at the SSC will continue to be funded under the High Energy Physics program as has been the past practice for other accelerators. Similarly, most of those who will conduct research at the SSC will come from the university community, as is the case at the existing accelerators. More than 75 percent of the research done at U.S. High Energy Physics accelerator facilities is carried out by university-based scientists and graduate students. Their participation is critical to the strength and vitality of the U.S. program, both in the production of research results and in the training not only of new physicists, but also of scientists and engineers in other disciplines.

Before turning to a discussion of the FY 1991 budget request, I would like to summarize some of the recent progress made by the university and laboratory scientists working at the three High Energy Physics accelerator facilities. The capabilities of the Tevatron at Fermilab allow scientists to observe a larger number of particle interactions than at any other facility in the world. Scientists there are searching for an as yet unobserved, but theorized, particle known as the "top quark" whose existence, if verified, would confirm predictions of the Standard Model. Based on analysis of the results of experiments run in 1989, Fermilab investigators have shown that the mass of the top quark must be greater than 78 billion electron volts (GeV). Thus, the search must continue through experiments at even higher energies which are available only at the Tevatron.

At SLAC, the recently completed Stanford Linear Collider (SLC) has demonstrated the concept of linear colliders. Using 50 GeV beams, SLC is providing crucial data on the feasibility of building a next generation of higher energy linear colliders to permit experimentation in a new energy region. The second goal of the SLC is to study the so-called Z° particle, believed to be the "carrier" of the weak nuclear force. Detailed study of this particle provides important tests of the Standard Model including a direct measurement of the number of generations of neutrinos, which are uncharged elementary particles. Thus far, scientists at the SLC have detected more than 500 Z° particles at 7 energy levels. Using these particles, scientists made the first precise measurement of the width and mass of the Z°

and have determined with a high degree of probability that, in conformance with the Standard Model, there are three generations of neutrinos.

At Brookhaven National Laboratory, the Alternating Gradient Synchrotron's (AGS) extensive facilities provide yet another different test of the Standard Model by studying the way (or mode) in which particles called "kaons" decay. Some of these decay modes occur very infrequently and thus are called rare decay modes. Using improved detectors, recent physics results have reduced the upper limits on the rates of decay for these rare decay modes to as low as one in three billion ordinary decays. The Standard Model predicts that these rare decays will occur at a rate lower than one in three billion. Ongoing studies will continue to provide experimental results for comparison with the predictions of the Standard Model.

FY 1991 HIGH ENERGY PHYSICS BUDGET REQUEST

The FY 1991 budget request for High Energy Physics is $621.2 million. Of the total amount, $494.2 million is for Operating Expenses, $88.2 million is for Capital Equipment, and $38.8 million is for Construction. (Tables 2 and 3).

The Operating Expenses request of $494.2 million provides for the continued participation of both experimental and theoretical university scientists and students who are critical to the success of the High Energy Physics program, as well as for the operation of the High Energy Physics accelerators: the Stanford Linear Collider, the Tevatron accelerator/collider, and the AGS. The Tevatron will conclude a major fixed target run which will be followed

Table 2
General Science and Research
High Energy Physics
Budget Authority
($ in millions)

	FY 1989	FY 1990	FY 1991 Request
Operating Expenses			
Physics Research	$ 121.6	$ 131.1	$ 140.3
Facility Operations	246.4	260.2	278.7
High Energy Technology	62.9	71.6	75.2
Subtotal	$ 430.9	$ 462.9	$ 494.2
Capital Equipment	79.8	84.1	88.2
Construction	39.1	35.1	38.8
Total High Energy Physics	$ 549.8	$ 582.1	$ 621.2

Table 3
General Science and Research
High Energy Physics
Budget Authority
($ in millions)

Construction

Project	TEC	FY 1990	FY 1991 Request
AGS Accumulator/Booster (86-R-105)	31.7	4.9	0[1]
Fermilab Linac Upgrade (90-R-104)	22.8	4.6	12.0
Accelerator Improvements and Modifications	$ N/A	$ 13.9	$ 14.5
General Plant Projects (GP-E-103)	N/A	11.7	12.3
Total Construction		$ 35.1	$ 38.8

[1] Funding completed in FY 1990

immediately by an extensive antiproton-proton colliding beam run. The latter will involve two major detector facilities: the upgraded CDF (Collider Detector at Fermilab) detector and the complementary new D-Zero detector which is scheduled for completion and commissioning in the summer of 1991. With these capabilities, the physics utilization of the Tevatron collider will effectively be doubled from its previous run.

Physics research at the SLC will emphasize use of the new polarized electron beam capability which will be commissioned during the year. This new capability has the same effect, for some measurements, as increasing the collision rate by a factor of 10. With this new polarized beam, the collision rate near the design level, and a new detector scheduled for completion late in 1990, we expect that the SLC will be at the leading edge of high energy physics research in FY 1991. The Positron-Electron Project will also be operated at SLAC utilizing the improved Time Projection Chamber detector.

The AGS will operate primarily for High Energy Physics rare kaon decay experiments. The new AGS Accumulator/Booster will be commissioned during FY 1991. It will improve the performance and capabilities of the AGS, in part by providing more intense beams, and will significantly increase the data collection rate for the experimental program.

The FY 1991 Operating Expenses request also includes funding to support long-range accelerator and detector R&D to develop the new concepts and technologies that are essential to the efficient operation, continued enhancement, and extension of accelerator and detector capabilities.

The FY 1991 Capital Equipment request of $88.2 million will provide the particle beam-line components, detection apparatus, and data analysis systems essential to forefront High Energy Physics research. In FY 1991, priority will be given to final completion of two major new collider detectors, one for SLC and one for the Tevatron, and to an upgrade of computer and data analysis equipment at universities participating in the program.

The FY 1991 Construction request of $38.8 million includes continued funding for the Fermilab Linac Upgrade project, a key element in maintaining a productive research program with the Fermilab Tevatron in the years before the SSC becomes operational. The Construction request includes $12.0 million for this $22.8 million project. The Linac Upgrade will replace a portion of the existing accelerator hardware for which commercial replacement parts are no longer available. This upgrade will increase the output energy of the linac from 200 to 400 million electron volts. The increased output energy will increase both the Tevatron collider collision rate and the beam intensity for the fixed target program, thus permitting additional experiments and increasing the likelihood of observing rarer occurrences such as the creation of the top quark. The Construction request also includes $14.5 million for Accelerator Improvements and Modifications (AIM) and $12.3 million for General Plant Projects (GPP). AIM projects provide for improvements to research accelerators and related experimental facilities, while GPP projects address the need to upgrade general laboratory facilities. These projects are needed to maintain the scientific effectiveness, reliability, and efficiency of High Energy Physics facilities.

SUPERCONDUCTING SUPER COLLIDER

Although scientists working in high energy physics have made great progress in understanding the basic structure of matter and the fundamental forces, many important questions remain unanswered. The SLC and Fermilab Tevatron, together with other High Energy Physics facilities, will keep the U.S. program competitive and at the forefront in the search for answers to these questions for the next several years. However, to push the frontiers of knowledge into the trillion electron volt (TeV) mass region, where new and exciting discoveries are anticipated, a new, more powerful particle accelerator, the Superconducting Super Collider, is required.

The SSC will allow physicists to continue along a path of research that has dramatically altered the way we live, though the consequences often are not apparent for many years. Man's first steps on the moon would have been impossible without the basic conceptual understanding of gravity developed centuries earlier by Galileo and Newton. Radio and television and all the other electronic wonders of our age rest on the understanding of electricity and magnetism developed during the last century by Faraday, Maxwell, and Hertz. Nuclear power and nuclear medicine can be traced to the quests in the first half of this century by Rutherford, Bohr, and Fermi for a deeper understanding of the atom and the nucleus. The positive impact on individual lives of the new knowledge gained through this research can be seen in many areas. In nuclear medicine, for instance, it has been estimated that several million Americans each year receive medical diagnosis or treatment from techniques which were developed from the technologies and particle accelerators used in basic physics research. Striking examples include computer-assisted tomography (CAT), positron emission tomography (PET), and magnetic resonance imaging (MRI).

The SSC will be the world's preeminent facility for high energy physics research into the next century. The SSC is a proton-proton collider with an energy of 20 TeV per beam whose principal feature is two rings of approximately 10,000 superconducting magnets located in an underground tunnel 54 miles in circumference. The two rings of magnets will steer and focus the proton beams in opposite directions until they are made to collide at the various interaction regions where large detectors record the events for analysis by physicists. The SSC will permit scientists to explore this new trillion electron volt domain of physics which cannot be reached by any other facility either in existence or planned.

The SSC is a critical part of the Administration's initiative to strengthen the position of the Nation as a world leader in science and technology. It will be a symbol of the Nation's commitment to scientific leadership in this century and the next. We can be confident that the SSC will yield exciting discoveries and technological innovations that will likely affect major industrial and technological directions in the twenty-first century.

This past year has been one of significant achievement. In January 1989, the Department announced the selection of the site for the SSC in Ellis County, Texas, and the selection of Universities Research Association, Inc., as the management and operating contractor to establish the SSC Laboratory and to design, construct and operate the SSC. An interim laboratory facility has been set up in leased space in DeSoto, Texas, near the Ellis County site. The Laboratory currently has approximately 500 people on board.

Also during the year, the SSC Laboratory developed and presented to the Department a preliminary, site-specific design for the SSC along with a revised cost estimate and schedule. Design changes proposed by the Laboratory include increasing injection energy into the collider from 1 TeV to 2 TeV, increasing the inner diameter of the superconducting dipole magnet coils from 4 centimeters to 5 centimeters, increasing the circumference of the ring by about one mile to accommodate stronger beam focusing, and providing larger detector halls. These changes result from additional technical information that has recently become available. Results of the Tevatron collider operations, supercomputer simulations of SSC-like proton orbits, and experience with magnets at the HERA facility in West Germany indicate that these changes are necessary. These changes will ensure that the SSC will operate reliably at the design parameters of energy and collision rate with a minimum of commissioning time.

These design changes and updated cost estimates could raise the cost of the SSC to about $8 billion. The Department is concerned about the cost rising above the previous $5.9 billion estimate and is committed to keeping the cost as low as possible. However, we want to be certain that the facility we build will meet the physics goals of the SSC and will operate productively soon after completion of construction. The Secretary has indicated that the Department supports the technical conclusions of a recent High Energy Physics

Panel study that strongly reaffirmed that 20 TeV is the appropriate energy for the SSC. The Secretary also supports the proposed technical design changes. However, during the coming months, we will carefully review the new design and cost estimate and will develop a validated technical, cost, and schedule baseline for the SSC. This review, which will be carried out with assistance from outside technical consultants and the Department's Independent Cost Estimating Group, should be completed by about August 1990.

As the Committee is aware, the State of Texas has made a commitment to contribute approximately $1 billion towards the construction of the project. We have had a series of discussions with the State's representatives and we expect to reach agreement with them in 1990 on the scope and pattern of their contribution. We have recently announced the so-called "footprint" for the facility. This enables Texas to identify the specific parcels of land required so that preparations for land acquisition can begin, and so that on-site activities needed to complete the Supplemental Environmental Impact Statement can be conducted. The SSC Laboratory has awarded a contract to the Lockheed Company to provide systems engineering and integration support. The Laboratory has also selected for contract negotiation an Architect-Engineer/Construction Management contractor to design and supervise construction of conventional facilities. In the near future, an industrial contractor will be selected competitively by the Laboratory to participate in finalizing the design of the superconducting collider dipole magnets, to develop a cost-effective and reliable manufacturing process, to fabricate prototype magnets and to demonstrate the production process by fabricating a significant number of magnets using final production tooling.

The major focus of the ongoing research and development program continues to be the superconducting dipole magnets. The R&D program conducted over the past few years on the original magnet design accomplished its objective of developing a main line magnet configuration which provided the basis for proceeding with engineering development and with establishment of the manufacturing process. The emphasis of the program will now shift to developing a design for the revised magnet specifications recently proposed by the Laboratory which call for increasing the inner diameter of the superconducting coil from 4 centimeters to 5 centimeters and reducing the length of most of the magnets from 17 meters to 15 meters. We expect to have the first short model (1 meter) of a new design magnet tested late in 1990 and the first full length (15 meter) magnet completed in 1991.

Another important activity during the last year was the preparation of a plan for seeking international contributions. The plan was developed in cooperation with the Office of Management and Budget, the Office of Science and Technology Policy, the National Security Council, the National Science Foundation, and the Commerce and State Departments, as well as with other appropriate agencies within the Executive Branch. The plan sets out our international objectives, the policy and regulatory framework in which we will conduct the international negotiations, and the strategy for establishing appropriate international agreements. Our proposed strategy builds upon the experience of the U.S. High Energy Physics program in international cooperation and the experiences of other major research laboratories in Europe and Japan. We recognize the need to apprise Congress of our international cost-sharing strategy but have postponed doing so pending our review of the preliminary site-specific design and cost estimates. We have begun briefing Congress on the International Plan. We also recognize the need to notify Congress prior to entering into any final agreements on foreign contributions.

Foreign interest in the SSC was evident at an International Conference on Supercollider Physics and Experiments hosted by the SSC Laboratory in early October. About 20 percent of the approximately 600 participants were from overseas, thereby reflecting the considerable worldwide interest in the program. The SSC Laboratory has also organized several advisory committees, which include foreign scientists, to seek the best scientific advice in order to optimize the machine's design, and to conduct the most appropriate experimental research program consistent with available resources.

FY 1991 BUDGET REQUEST FOR SUPERCONDUCTING SUPER COLLIDER

The FY 1991 budget request for the Superconducting Super Collider (SSC) is $317.9 million. That request includes $116.0 million for Operating Expenses, including $5.7 million for Program Direction; $33.0 million for Capital Equipment; and $168.9 million for Construction. (Table 4).

The Operating Expenses request of $116.0 million provides for an enhanced level of R&D for the superconducting magnets and to support the transition to industrial fabrication of pre-production magnets which is planned for FY 1992. The request will allow substantial work on the conceptual design of other collider systems, including the focusing and correction magnets, cryogenics

Table 4
General Science and Research
Superconducting Super Collider (SSC)
Budget Authority
($ in millions)

	FY 1989	FY 1990	FY 1991 Request
Operating Expenses			
Research and Development	$ 81.6	$ 68.0	$ 110.3
Program Direction	0.5	0.9	5.7
Subtotal	82.1	68.9	116.0
Capital Equipment	16.0	20.7	33.0
Construction (90-R-106)	-	129.0	168.9
Total SSC	$ 98.1	$ 218.6	$ 317.9

and the injector system. The request will also support a needed expansion in the detector subsystems R&D program.

The Capital Equipment request of $33.0 million will provide for prototypes in support of the R&D activities on the many accelerator components and systems of the collider and its four injector accelerators, such as power supplies and test and control instrumentation. The request also provides for components for the magnet test facility. Further equipment funds will also be used for prototypes of detector subsystems and components as SSC experiments and detectors become more completely defined, as well as for general laboratory and computer equipment essential for establishing a new research laboratory.

The FY 1991 Construction request of $168.9 million will allow construction-related activities to proceed in a number of areas, including detailed design of technical systems and conventional facilities, industrialization of magnets, procurement of materials for the magnet prototypes, initial fabrication of injector system components, site preparation, and project management and support. No tunneling construction is expected to occur until a decision has been made to go to commercial production of the superconducting magnets.

The FY 1991 budget request for SSC Program Direction is $5.7 million. The requested funds are required to provide for the salaries, benefits, travel and other expenses associated with 52 full-time equivalent employees for the Office of Superconducting Super Collider, both at Headquarters and at the SSC on-site Project Office. The new management organization for the SSC is consistent with the Secretary's objective of strengthening Departmental management of its large projects. It provides direct line management authority including an on-site office reporting directly to the headquarters program office, with significant expertise in the area of project management and control.

NUCLEAR PHYSICS

Nuclear processes determine the physical characteristics of our universe. Thus, an understanding of nuclei and nuclear phenomena is essential to understanding the world around us. The science of nuclear physics has spawned many diverse technologies, including nuclear weapons, nuclear power, and nuclear medicine. While these technologies are mature and are conducted independently of the research program, vital interactions still occur in the pursuit of better theories of nuclear structure and reactions, in the development of advanced instrumentation of mutual interest, and in the need for more precise data in selected areas.

The interaction between nuclear physics and other disciplines can be seen in many areas, including medicine and basic materials research. In the area of medicine, Nuclear Physics accelerators provide the facilities for the diagnosis and treatment of cancers using beams of charged particles. Extensive and diverse cooperation also occurs in the area of activation analysis, a nondestructive nuclear technique using small neutron generators to identify, in detail, the composition of complex materials. For example, neutron activation is a widely used technique in oil exploration to identify the substances through which a well test bore passes. Use of this technique to identify trace element impurities shows promise for improving the clean burning of coal; and nuclear physicists active in heavy ion research have helped perfect a process which uses activation analysis to identify plastic explosives that might be smuggled aboard aircraft in the luggage of terrorists.

These applications of basic research are made possible by a growing fundamental understanding of the materials and forces of nature. Over the years, many theoretical models have been developed to describe the structure of the nucleus and its behavior. Models in which nuclear matter is treated as a fluid (liquid drop model) or an organized collection of nucleons (shell model) have been highly developed. More fundamentally, scientists now know that neutrons and protons, the constituents of the nucleus that are called nucleons, are composed of smaller constituents called quarks. These quarks are believed to be bound together in tightly knit groups of threes. Despite many attempts, scientists have not been able to isolate single quarks outside the nucleus. It is as if quarks were tied together by elastic strings that cannot be broken. This confining mechanism forms the basis of the newest theory of the strong nuclear force, called quantum chromodynamics (QCD). Many aspects of this theory are addressed both by the Nuclear Physics and High Energy Physics research programs. However, only the Nuclear Physics program emphasizes tests of QCD predictions of quark behavior in nuclear matter. Only within the medium of nuclear matter can an individual quark be separated from its tightly knit group and studied as a free entity.

The Nuclear Physics research program is carried out at accelerator facilities around the country. Accelerators located at Lawrence Berkeley Laboratory (LBL), Argonne National Laboratory (ANL), Oak Ridge National Laboratory (ORNL), Los Alamos National Laboratory (LANL), Brookhaven National Laboratory, and the Massachusetts Institute of Technology (MIT) support broad research programs with experimental time allocated on the basis of scientific merit. Smaller facilities dedicated to in-house research are located at Yale University, the University of Washington, Triangle Universities National Laboratory, and Texas A&M. In addition, nuclear physics research is performed using experimental facilities located at High Energy Physics accelerators.

In FY 1990, Nuclear Physics accelerators continued providing beams for a vigorous research program. Operating time which was increased at the LBL 88-inch cyclotron and at the Tandem/AGS facility at BNL in FY 1989 will continue in FY 1990. Operations at the Clinton P. Anderson Meson Physics Facility at LANL were enhanced by the start of research using a new source of polarized protons which permitted new detailed measurements of nuclear structure. The LBL Bevalac produced record intensities of uranium beams for its heavy ion research program as a result of continuing improvements and modifications to its accelerators. Similarly, the Holifield Heavy Ion Research Facility at ORNL achieved a new high in terms of both research hours and number of users, with the latter representing 50 institutions.

The experimental research program based on the use of these facilities was also very productive. At ANL, the phenomenon of super deformation was extended to a new region of nuclear masses. Deformed nuclei roughly take the shape of a football. Superdeformed nuclei are approximately twice as elongated as a football. Existing theories cannot explain the transition of nuclei into these shapes. The proposed Gammasphere detector, a gamma ray detector for nuclear structure research which consists of 120 separate and complex Germanium detector units is designed to address this rapidly evolving area. At the Bates Linac at MIT, an international scientific team made the first complete measurement of the charge distribution of the deuteron, which is composed of one proton and one neutron. New techniques and more precise data identified a deformed as well as a spherical component of the electric charge distribution of this simplest possible composite nucleus. The aspect of the nuclear force that gives rise to this deformation could form the basis of improved theories of superdeformation. A combination of results from experiments using the Tandem/AGS at BNL and the Super Proton Synchrotron at the European Organization for Nuclear Research (CERN) have measured the temperature of nuclear matter produced by relativistic heavy ion collisions. These experimental results, combined with extended theoretical calculations, confirm that even higher temperatures will be produced by the proposed Relativistic Heavy Ion Collider (RHIC) facility, which I will discuss shortly. RHIC will permit temperatures high enough to study, for the first time, the quark-gluon plasma, the fundamental quark particles in the nucleus, and the strong force that holds them all in place.

FY 1991 NUCLEAR PHYSICS BUDGET REQUEST

The FY 1991 budget request for the Nuclear Physics program is $330.7 million. Of that total, $215.5 million is for Operating Expenses, $26.7 million is for Capital Equipment, and $88.5 million is for Construction (Table 5).

The FY 1991 Operating Expenses request will maintain an approximately constant level of program activity in low and medium energy physics, in heavy ion nuclear physics, and in nuclear theory. The FY 1991 request provides for an increased level of support for the Continuous Electron Beam Accelerator Facility (CEBAF) with $12.2 million allotted to R&D, testing and prototyping of accelerator components and support of detector development, and $12.4 million for start-up of laboratory operations and accelerator commissioning. Already, 245 physicists from 60 institutions have submitted 47 research proposals for experiments at CEBAF. From these proposals, a program of experiments will ultimately be selected to be carried out when the facility goes into operation in FY 1994. Special emphasis will continue to be placed on effective use of the upgraded accelerators at the University of Washington, Texas A&M University, and Yale University as well as the Alternating Gradient Synchrotron at Brookhaven. At the University of Washington, the second year of operations of the Nuclear Theory Institute will provide an increased number of study programs and workshops.

Research and development in support of the next generation of accelerators will also be supported by the Operating Expenses request, including work at

Table 5
General Science and Research
Nuclear Physics
Budget Authority
($ in millions)

	FY 1989	FY 1990	FY 1991 Request
Operating Expenses			
Medium Energy Nuclear Physics	$ 85.2	$ 92.4	$ 101.0
Heavy Ion Nuclear Physics	66.5	67.6	72.9
Low Energy Nuclear Physics	24.5	26.3	28.1
Nuclear Theory	10.8	12.2	13.5
Subtotal	$ 187.0	$ 198.5	$ 215.5
Capital Equipment	$ 18.5	$ 19.7	$ 26.7
Construction	52.5	71.5	88.5
Total Nuclear Physics	$ 258.0	$ 289.7	$ 330.7

BNL to extend the scientific and technical basis for the proposed Relativistic Heavy Ion Collider.

The Capital Equipment request of $26.7 million will provide for instrumentation required to effectively use the national accelerator facilities operated by the program. These funds will provide such equipment as particle detection systems, data acquisition and analysis systems, and instrumentation to improve the performance of the accelerators. The Capital Equipment request also includes funds to start assembly of the Sudbury Neutrino Observatory, a laboratory for neutrino astrophysics, to be built as a collaborative U.S., Canadian, and United Kingdom project. The request also includes funds to begin fabrication of Gammasphere, the gamma ray detector for nuclear structure research that I mentioned earlier. Finally, the FY 1991 request will provide for general purpose equipment to meet the laboratory-wide needs of LBL.

The FY 1991 Construction request for Nuclear Physics is $88.5 million. (Table 6) Of that amount, $65.0 million is for CEBAF, an accelerator with electron beams in the energy range of 0.5 to 4.0 GeV that will provide access to the critical transition region between the traditional (i.e., nucleon) and the emerging (i.e., quark) descriptions of nuclear matter. CEBAF is expected to revolutionize the production and collection of data for nuclear physics research in the area of electromagnetic interactions with nuclei. The FY 1991 construction funds will be used for continued construction of the beam enclosure tunnel and support structures as well as for major hardware

Table 6
General Science and Research
Nuclear Physics
Budget Authority
($ in millions)

Construction

Project	TEC	FY 1990	FY 1991 Request
Continuous Electron Beam Accelerator Facility (87-R-203)	265.0	62.6	65.0
Relativistic Heavy Ion Collider	397.0	-	15.0
Accelerator Improvements and Modifications	$ N/A	$ 4.5	$ 4.3
General Plant Projects	N/A	4.4	4.2
Total Construction		$ 71.5	$ 88.5

fabrication of radio-frequency cavities, cryounits, the central helium liquefier and transfer lines, and the linac and arc magnets.

The Construction request also includes $15.0 million to initiate construction of the Relativistic Heavy Ion Collider (RHIC). The Department's Nuclear Science Advisory Committee and the National Research Council have both confirmed the importance of this facility which will provide unprecedented opportunities to produce and study ultradense matter. With a Total Estimated Cost of $397.0 million, RHIC will be a unique, world-class facility with colliding beams that provide collision energies of 100 GeV per nucleon for heavy ions as massive as gold nuclei. At these energies, scientists will be able to form a unique kind of matter called a quark-gluon plasma which will create conditions in the laboratory that are similar to those of the expanding universe moments after the Big Bang. In this plasma, quarks will be separated from their tightly knit clusters and will move independently through the interior of a nucleus. The accelerator will be built in the existing circular tunnel at BNL. FY 1991 construction funds will be used to purchase superconducting wire for fabrication of arc magnets. In other areas, systems engineering and design will be carried on during the first year of the project.

The Construction request also includes $4.3 million for Accelerator Improvements and Modifications (AIM) and $4.2 million for General Plant Projects (GPP). AIM projects provide for improvements to research accelerators and related experimental facilities, while GPP projects address the need to upgrade general laboratory facilities. These projects are needed to maintain the scientific effectiveness, reliability and efficiency of Nuclear Physics facilities.

GENERAL SCIENCE PROGRAM DIRECTION

The FY 1991 budget request for General Science Program Direction is $3.9 million. The requested funds are required to provide for the salaries, benefits, travel, and other expenses associated with 46 full-time equivalent employees in the Office of High Energy and Nuclear Physics and associated support staff required to administer these programs.

BASIC ENERGY SCIENCES

Basic research is the first link in the chain of events from scientific discovery to technological innovation. Results from research sponsored by the Basic Energy Sciences (BES) program help form the information base that underpins the Nation's nuclear and non-nuclear energy technologies. While the principal focus of the BES program is directed toward supporting the Department's energy goals, a number of other important national goals are also supported, including U.S. leadership in science and technology, the stimulation of economic growth and national defense, and the training of tomorrow's scientists.

Research in the BES program is grouped into six major subprogram areas: Materials Sciences, Chemical Sciences, Applied Mathematical Sciences, Engineering and Geosciences, Advanced Energy Projects and Energy Biosciences.

Research in each of these areas is primarily driven by the need for enhanced knowledge or understanding which currently limits existing technologies. The link between basic research and applications, however, is not generally confined to any single energy or technology problem. For example, a new or improved ceramic material may be applied to energy systems--whether they be fossil, nuclear, or automotive--or that material may provide an effective way to immobilize and store radioactive waste. Each of the BES subprograms supports research projects which have applications across a broad range of technologies. Whether the issue is how to burn fuel more efficiently or how to safely and cost-effectively dispose of waste materials, the solution to the problem depends on the results of basic research and the application of those results to the appropriate technology.

In addition to supporting research over a wide range of technical areas, the BES program provides support for the operation of major user facilities such as synchrotron radiation sources, neutron sources, and the Combustion Research Facility at Sandia National Laboratories (Livermore). These national facilities are maintained and operated for the benefit of all qualified researchers from Government laboratories, academia, and industrial laboratories. The seven major BES user facilities are critical to the success of the BES research program and are playing an increasingly important role in research carried out by the private sector. At the synchrotron light sources, for instance, the largest U.S. companies are doing research in such areas as catalysis and electronics; and major oil companies are investigating the porosity of geologic formations using the neutron sources. Advances in materials, chemistry, biology, and the next generation of computer chips truly depend on these facilities.

During the last year, the Department carried out an extensive review of its nuclear facilities. Based on this review, the Secretary decided to transfer management of all nuclear research reactors, including BES's High Flux Isotope Reactor and High Flux Beam Reactor, to the Assistant Secretary for Nuclear Energy. The respective program offices retain responsibility for funding and directing these scientific facilities.

Approximately 60 percent of the BES-supported research is carried out at the national laboratories where all but one of the user facilities are located. Since these laboratories are also involved in many aspects of the applied energy programs, they are skilled at facilitating the transfer of scientific information and technology from experiment to application. The BES program also provides significant direct funding support to universities, in addition to providing them with research time at the various user facilities.

Every year there are important results in each of the research areas supported by the BES program. Some of the most interesting recent results include:

o Surprising research results discovered by Nobel Laureate Y. T. Lee at LBL. These results were obtained using molecular beams to study chemical reactions of energetic benzene molecules. Benzene is a minor but common constituent of many fuels and thought to be a major contributor to soot formation. Using laser radiation, Professor Lee is able to cause individual benzene molecules to begin to degrade chemically, just as they would do in the environment characteristic of combustion. His experiments have demonstrated surprisingly extensive rearrangements of benzene's constituent hydrogen and carbon atoms - much more extensive than would have been anticipated from conventional chemical wisdom. This research has potentially far-reaching implications for chemistry and, ultimately, for the design and control of optimum combustion systems.

- Development at Ames Laboratory of a new, simple, and efficient way to synthesize silicon carbide. This new approach, which makes it possible to produce silicon carbide in the form of fibers, is likely to cut both the time and the cost of current commercial production of silicon carbide fibers. Materials containing these silicon carbide fibers are replacing metal in industrial and military applications due to their strength, low weight, high heat tolerance, and resistance to chemical breakdown. A patent application has been filed, and several industrial concerns have expressed serious interest in this new development.

- Development by scientists at the Princeton Plasma Physics Laboratory of an X-ray laser microscope that is capable of revealing the details of biological systems. This accomplishment, which was recognized by a 1989 R&D 100 Award, allows scientists to take pictures of living cells and observe such processes as the invasion of a virus. The availability of this microscope is expected to greatly expand our ability to study the structure and dynamic processes of biological cells.

- Development of a new imaging technique at ORNL that can "see" new details of defects in high temperature superconductors and many other materials. Using this technique, scientists have learned that the achievement of high critical current densities in the oxide superconductors depends strongly on the geometry of certain defects. These high current densities are one requirement for practical applications of high temperature superconductors in electric motors, generators, and transmission lines. This result leads to renewed optimism that current densities in high temperature superconductors can be raised to useful levels.

- Development at ANL of a new class of chemicals for environmental and nuclear waste applications. These chemicals, called thermally unstable complexants, are environmentally compatible chemical clean-up agents. They remove transuranic and other metal contaminants from waste streams to very low levels and, after further development, could be applied to nuclear wastes, ground water, and metallurgical processes.

- Development of a mathematical technique that makes possible computer modeling of the propagation of cracks in materials, such as airplane fuselages and engine fan blades. The annual cost of fracture-related damage in the U.S. has been estimated at over $10 billion. This new mathematical technique, discovered at Oak Ridge National Laboratory, has been implemented in a structural analysis computer program by Cornell University to form a useful tool in material structure studies.

FY 1991 BASIC ENERGY SCIENCES BUDGET REQUEST

The FY 1991 budget request for Basic Energy Sciences is $648.7 million. The request includes $503.7 million for Operating Expenses, $37.0 million for Capital Equipment, and $108.0 million for Construction. (Table 7)

The Operating Expenses request maintains a strong core research program in each of the BES subprograms. Research in Materials Sciences continues to improve our theoretical and experimental capability to analyze the fundamental structure and behavior of materials. In doing so, materials research contributes to the development of new or substitute materials that can improve performance and efficiency in energy systems. It creates the capability to tailor materials properties to satisfy defined requirements, such as improved corrosion resistance in fossil plants, and to predict materials problems and service life. The 1991 request of $222.0 million will provide for continuing research programs in high temperature superconductivity, solid state physics, materials chemistry, metallurgy, and ceramics. Funding for support of major user facilities is also included in this request.

The Chemical Sciences subprogram, with an FY 1991 request of $150.5 million, investigates the chemical properties of matter and the interactions of the component molecules, atoms, ions, and electrons. Chemical sciences research ultimately affects such areas as production of fuels and chemicals from coal,

Table 7
Energy Supply R&D
Basic Energy Sciences
Budget Authority
($ in millions)

	FY 1989	FY 1990	FY 1991 Request
Operating Expenses			
Materials Sciences	$ 173.7	$ 198.7	$ 222.0
Chemical Sciences	127.8	140.3	150.5
Applied Mathematical Sciences	42.1	43.7	48.0
Engineering and Geosciences	32.8	33.2	32.5
Advanced Energy Projects	14.3	14.6	24.0
Energy Biosciences	20.4	20.6	20.2
Program Direction	4.9	5.4	6.5
Subtotal	$ 416.0	$ 456.5	$ 503.7
Capital Equipment	31.7	36.5	37.0
Construction	86.6	76.8	108.0
Total Basic Energy Sciences	$ 534.3	$ 569.8	$ 648.7

nuclear waste separation, conversion of biomass (such as wood and leafy materials) into liquid fuels, and detection and measurement of harmful products of energy processes. In FY 1991, the research program will emphasize areas relevant to the environment, waste management, and combustion. The FY 1991 budget request also includes support for major user facilities.

Applied Mathematical Sciences supports long-range mathematical and computational research. Computational methods provide insights into experimental data and simulate ideal experiments for testing analytical models. This subprogram advances all aspects of scientific computation--from proofs of theorems about mathematical equations to understanding the structure of parallel computer systems. With an FY 1991 request of $48.0 million, Applied Mathematical Sciences will continue to provide access to, and expand the capabilities of, the supercomputer network that is essential for researchers supported by the Office of Energy Research. Selected increases will be provided for research, fellowships, and problems identified in the Government-wide initiative in high performance computing. This initiative, which is being coordinated by the Federal Coordinating Committee on Science, Engineering and Technology (FCCSET), recognizes the need to maintain and extend U.S. leadership in high performance computing. As a major user of high performance computing and a pioneer of the use of supercomputers for modeling complex physical systems that are too dangerous, expensive, or poorly understood to build and test, DOE strongly supports this initiative and looks forward to playing a key role in achieving its objectives.

The Engineering and Geosciences subprogram, with an FY 1991 request of $32.5 million, includes two broad disciplines. Research in engineering aims to expand our knowledge of the processes and concepts that underlie current engineering practice in energy technologies and to broaden the technical and conceptual base for solving future problems. The FY 1991 request will continue fundamental engineering research with emphasis on topics important for energy production and use, as well as those meeting the Department's long-term objectives for restoration of the environment. Such topics include flow of oil, gas, and water through porous materials such as soil and rocks and two phase flow in energy systems--for instance, mixtures of water and steam in nuclear reactors. Work is also underway on what are called intelligent machines, for example, the mobile robots to be used for cleanup of contaminated sites. In Geosciences, the research emphasizes the development of a predictive understanding of the energy-related aspects of geological, geophysical, and geochemical process related to the Earth. Emphasis in FY 1991 will be on high-resolution underground imaging related to enhanced oil recovery and waste management, as well as on continental scientific drilling. In the latter area, site studies to investigate existing geological structures will be carried out at Katmai, Alaska where drilling is scheduled to start in FY 1992.

The Advanced Energy Projects subprogram, with an FY 1991 request of $24.0 million, explores the feasibility of novel, energy-related concepts evolving from basic research that are at an early stage of scientific definition and, therefore, are not yet of practical use to technology programs. In FY 1991, research will continue on heavy ion accelerators with the goal of validating this technology as a possible inertial fusion driver; and additional funds will be provided on a cost-shared basis with industry to transfer synchrotron radiation technology (x-ray lithography) to industry for use in developing next generation computer chips.

The FY 1991 request for the Energy Biosciences subprogram is $20.2 million. Research in this area continues to increase our understanding of basic biological principles, biological mechanisms, and organisms useful for energy applications, such as the production of fuels from biomass materials. In FY 1991, this subprogram will continue its base program in plant and microbial sciences, including support for the plant science centers supported jointly by the Department, the National Science Foundation, and the Department of Agriculture.

The Program Direction request for FY 1991 is $6.5 million. This request will provide funds for the salaries, benefits, and travel related to 70 full-time equivalent staff.

The BES Capital Equipment request for FY 1991 is $37.0 million. These funds will ensure that BES-supported researchers will continue to have the equipment needed to initiate and continue advanced research, much of which involves experiments at extremes of temperature and pressure. Reliable, precise measurements under these conditions challenge the current state-of-the-art. Replacements and new equipment funded under this request, which are important to the continued success of the program, include such items as electron microscopes, neutron spectrometers, molecular beam equipment and computers for equipment control and data analysis.

The FY 1991 Construction request of $108.0 million (Table 8) includes continued funding for the construction of the 1-2 GeV Synchrotron Radiation Source at LBL as well as the 6-7 GeV Synchrotron Radiation Source at ANL. Both facilities are needed to cover the entire radiation range needed for experiments supported by the BES program. The 1-2 GeV project is a third generation light source in the vacuum ultra violet/soft x-ray range. The unique capabilities of this facility will make possible new basic and applied science studies in such areas as materials and surface science, atomic and molecular physics, chemistry, and biology. The FY 1991 request includes $23.0 million for this project. The 6-7 GeV project is a new, hard x-ray synchrotron light source which has been rated as the top priority by several scientific panels, including one from the National Academy of Sciences. It will provide brilliant x-ray beams that will serve the research needs of virtually all scientific disciplines and many technology fields. The FY 1991 request for this project includes $75.0 million to continue accelerator and conventional facility construction. Of the remaining $10.0 million, $7.0 million is for Accelerator Improvements Projects and $3.0 million is for General Plant Projects. Each of these categories is comprised of smaller projects which are necessary to maintain plant and facilities at several DOE laboratories. The projects include a wide spectrum of improvements necessary to protect property and personnel and to modify existing scientific facilities to allow the most cost-effective utilization of their technical capabilities.

Table 8
Basic Energy Sciences
Construction Summary
($ in millions)

Project Title	TEC	FY 1990	FY 1991 Request
1-2 GeV Synchrotron Radiation Source (LBL)	$ 99.5	$ 25.6	$ 23.0
3 GeV SPEAR Injector (SSRL)	14.0	4.5	0
6-7 GeV Synchrotron Radiation Source (ANL)	456.0	39.4	75.0
Accelerator Improvements Projects	N/A	4.5	7.0
General Plant Projects	N/A	2.8	3.0
Total Basic Energy Sciences Construction		$ 76.8	$108.0

MAGNETIC FUSION ENERGY

Fusion is the process by which the sun and other stars produce energy. The continuing goal of the Magnetic Fusion Energy program is to develop theory and conduct experiments to determine how fusion reactions can be controlled and used to produce energy. Steady progress has been made but the scope of work is formidable. Fusion is an attractive source of energy for several reasons. The fusion fuels (deuterium and tritium) are easily obtained and virtually inexhaustible. In addition, fusion reactors can be designed to yield very little long-lived radioactive waste. Finally, fusion powerplants would have attractive safety features because there would be only small amounts of relatively low-hazard fuel present at any one time and the fusion reaction could not run out of control.

The path to successful development of magnetic fusion energy for practical use requires development of a device that can heat the deuterium-tritium fuel to the required high temperature and confine the heated fuel long enough so that more energy is released in the fusion reactions than is used to heat the fuel; in other words, a significant energy gain is achieved. The leading candidate for confining the hot plasma fuel is a donut-shaped magnetic configuration called a tokamak. The program is currently trying to enhance its understanding of energy confinement in order to clarify the requirements for significant energy gain. In addition, research and development are required to improve the potential economics of fusion. Finally, the Magnetic Fusion Energy program is participating in the initial phase of an integrated worldwide program whose long-term objective is to establish the science and technology base for fusion and, thus, create opportunities for the U.S. to benefit from collaboration on major facilities.

The program is organized around four key technical issues. The first is understanding how the plasma behaves once fusion reactions are producing sufficient heat to maintain reacting or burning conditions. The second is determining the best confinement configuration by studying potentially improved devices or fuels. The third issue involves research on materials to see which ones provide the best safety margin and the lowest levels of induced radioactivity when introduced to a fusion reactor environment. The fourth issue requires the development of the nuclear technology to effectively and safely convert fusion energy to electricity.

The program currently emphasizes the first two issues. These efforts are aimed at developing a predictive understanding of the mechanisms that control energy confinement within the tokamak. Experimental data suggest that improved confinement will be required for the next generation of devices. Scientists have already observed this improved confinement in a number of tokamak devices. The program is working on developing the understanding necessary to apply these observed improvements to future devices.

Before I turn to a discussion of the FY 1991 budget request, I should note that an independent, high-level review of fusion will be carried out in FY 1990. The objective of the Fusion Policy Advisory Committee will be to review and update the Department's fusion policy, covering both the magnetic and inertial confinement programs. The Committee review will focus on the technical status of the programs and will recommend how to structure them. The FY 1991 budget request provides for maintaining the current magnetic fusion program balance, with a focus on confinement physics. Budget estimates will be revised as necessary once the review is completed and the Department has determined what changes, if any, to make in the program.

FY 1991 MAGNETIC FUSION ENERGY BUDGET REQUEST

The FY 1991 budget request for Magnetic Fusion Energy is $325.3 million. This includes $291.9 million for Operating Expenses, $14.3 million for Capital Equipment, and $ 19.1 million for Construction (Table 9).

The Fusion budget is organized into five major subprograms: Confinement Systems, Applied Plasma Physics, Development and Technology, Planning and Projects, and Program Direction. Confinement Systems, with an FY 1991 Operating Expenses request of $163.0 million, operates large experimental devices and analyzes the data to improve our understanding of plasma behavior and to learn how to obtain and control the physical conditions necessary to ultimately produce fusion energy. Research is currently being conducted on several toroidal devices, primarily tokamaks, to investigate key physics issues and prepare for performing burning plasma physics experiments on future devices. One important aspect of present experimental research is the effort to obtain a better understanding of transport, or energy loss, in tokamak plasma systems.

Table 9
Energy Supply R&D
Magnetic Fusion Energy
Budget Authority
($ in millions)

	FY 1989	FY 1990	FY 1991 Request
Operating Expenses			
Confinement Systems	$ 172.7	$ 160.2	$ 163.0
Applied Plasma Physics	81.2	71.6	70.9
Development and Technology	54.1	47.4	48.1
Planning and Projects	1.1	4.2	4.2
Program Direction	4.6	5.0	5.7
Subtotal	$ 313.7	$ 288.4	$ 291.9
Capital Equipment	18.8	13.3	14.3
Construction	12.2	18.6	19.1
Total Magnetic Fusion Energy	$ 344.7	$ 320.3	$ 325.3

The Tokamak Fusion Test Reactor (TFTR) at Princeton Plasma Physics Laboratory (PPPL) is the largest U.S. tokamak, with a long-term goal of conducting plasma experiments using deuterium-tritium fuel at plasma temperatures and densities similar to those anticipated in a future fusion reactor. During the past calendar year, the TFTR program has focused on the energy transport issue. New diagnostics were fabricated and installed, and new techniques for obtaining improved confinement were developed. The Advanced Toroidal Facility at ORNL will contribute to the understanding of confinement in tokamaks, while Doublet III-D at General Atomics is the focal point for a variety of ongoing experiments on plasma transport. During the past year, scientists at Doublet III-D also achieved a new world record beta value for tokamaks. Beta is defined as the ratio of the plasma thermal energy to the magnetic pressure that is used to confine the plasma. Doublet III-D experiments achieved a peak beta value as high as 9.3 percent and sustained a beta value of 8 percent for almost a second. This is greater than the beta value thought to be necessary for economical fusion reactors. Abroad, the Joint European Torus in Great Britain has essentially reached equivalent energy breakeven conditions in deuterium, in other words, conditions where the energy released is equal to that required to heat the fuel.

Upgrades for microwave heating experiments on the Princeton Beta Experiment will be completed in FY 1990 and the device will resume its research operations aimed at operating under higher plasma pressure conditions in FY 1991. Fabrication of the Alcator C-Mod facility at the Massachusetts Institute of Technology will be completed in early FY 1991, and initial operations are planned for FY 1991. This facility will allow scientists to study plasma performance with a compact, high-field, high-density design using improved plasma edge controls in support of a future burning plasma physics experiment. Preliminary design activities for the Compact Ignition Tokamak will continue to improve projected performance. Technology R&D will also be conducted in support of prototype development.

Applied Plasma Physics, with an Operating Expenses request of $70.9 million, plays a major role in addressing the magnetic confinement and burning plasma physics issues at a very fundamental level. The subprogram conducts research on potentially attractive advanced confinement configurations and on basic magnetic confinement physics. It also develops information on new diagnostics and techniques to heat and control plasma, and provides computational and theory support for the overall program. In FY 1991, this subprogram will continue to expand our understanding of magnetically confined plasma through experiments with various magnetic configurations, including tokamaks, compact toroids, and reversed field configurations. Fabrication of the Large S Experiment (LSX) will be completed at Spectra Technologies in FY 1990 to further investigate the potentially attractive field reversed configuration concept. The Confinement Physics Research Facility, under construction at the LANL, will improve our understanding of reversed field pinches once it is operating. I will refer to this project later when I discuss the program's Construction request.

In FY 1991, research on applied plasma physics theory will give special emphasis to modelling and understanding the process of controlling the transport of energy and particles in toroidal plasma. The Texas Experimental

Tokamak (TEXT) at the University of Texas will be operated with new electron cyclotron heating and diverter hardware in order to compare transport data with other tokamaks. Support is also provided for the continued operation of the computer center at LLNL and the five user service centers. The computing capability will be improved through faster network access and additional local computing work stations.

With an Operating Expenses request of $48.1 million, the Development and Technology subprogram will continue to support the development of technologies required for fusion experiments and the design and analysis of fusion systems. During the last year, the first phase of the tritium proof-of-principle pellet experiments was completed at the Tritium System Test Assembly at LANL. During those experiments, scientists from ORNL obtained information that demonstrates the feasibility of tritium pellet fueling for next-generation experiments.

A number of international collaborative programs will be supported in FY 1991, including the International Thermonuclear Experimental Reactor (ITER). The ITER process is developing into a successful and unique model for large-scale, equal participation, international projects. An Interim Conceptual Design Report has been completed, with the full Conceptual Design Report to be completed in December 1990. ITER-related technology R&D tasks have been defined and are under way in each of the participant countries as part of the $8.0 million ITER technology R&D funding provided by each participant. Physics R&D tasks are being undertaken on a voluntary basis by the home program of participating countries. The Massachusetts Institute of Technology has just completed a pulsed supconducting coil winding, which is expected to be a technology applied to ITER for driving the plasma current. The coil will be shipped to Japan in April 1990 for joint testing by the U.S. and Japan. Successful operation of this large (2 meter) coil would be a major step in pulsed coil technology and would allow scale-up to full-sized, pulsed, superconducting ITER coils. With the conceptual design activity nearly completed, the U.S. will decide whether to enter discussions on the engineering design phase of ITER. A final decision on continued U.S. participation in ITER will depend on a variety of factors, including the recommendations of the Fusion Policy Advisory Committee and the outcome of the annual budget process.

The FY 1991 budget essentially provides for a continuation of FY 1990 activities. This includes such areas as development of high-field, steady-state, pulsed magnets and plasma heating and fueling components, development of low activation and radiation-resistant structural materials that have acceptable characteristics for the fusion reactor environment, and tasks to enhance the environmental and safety advantages of fusion. Materials also need to be developed that can resist high heat flux and erosion by the bombardment of plasma particles. Fusion nuclear components will continue to be developed to produce and process tritium safely and convert fusion energy into useful forms.

Finally, systems design work aimed at developing improved reactor designs, including inertial confinement concepts, is supported. Support of design and validating R&D for ITER is also supported.

The Planning and Projects subprogram provides support for construction of major new facilities and fabrication of auxiliary components for these facilities. The FY 1991 Operating Expenses request of $4.2 million is primarily for compliance with requirements associated with the Small Business Innovation Research program.

The Operating Expenses request of $5.7 million for Program Direction provides for personnel and other costs associated with 64 full-time equivalent employees.

The FY 1991 Capital Equipment request of $14.3 million will provide for essential hardware to support the overall program. This equipment includes diagnostic and computer equipment, power supplies, and other components for experimental facilities.

The FY 1991 Construction request of $19.1 million (Table 10) provides $11.1 million for continued construction of the Confinement Physics Research Facility (CPRF) at LANL. The CPRF will provide an experimental capability to explore the physics properties of a reversed field toroidal confinement experiment that has the theoretical capability, in a future device, of heating the plasma to ignition with lower magnetic fields. The FY 1991 request will allow the program to complete fabrication of the coils and the vessel and shell, to begin installation of these components, and to complete generator start-up tests.

Table 10
Magnetic Fusion Energy
Construction Summary
($ in millions)

Project Title	TEC	FY 1990	FY 1991
Confinement Physics Research Facility (89-R-800)	75.6	10.9	11.1
General Plant Projects	N/A	7.7	8.0
Total Construction		18.6	19.1

The remainder of the Construction request, $8.0 million, is for General Plant Projects (GPP). These GPP projects at LANL, PPPL, and ORNL provide for the continuing minor alterations and modifications necessary to protect the Government's investment in its facilities.

BIOLOGICAL AND ENVIRONMENTAL RESEARCH

The Biological and Environmental Research (BER) program supports research aimed at identifying, understanding, and anticipating the long-term health and environmental consequences of energy development and use. The program also contributes to the solution of major scientific problems in medicine and biology through the use of the Department's unique scientific and technological capabilities.

The BER research program, with its focus on human biology and health and on the environment, grew out of the program's initial mission to understand the potential health and environmental impacts of radiation. As definitive information was obtained concerning relatively high levels of radiation exposure, attention was turned to potential effects at lower doses that might be received by worker populations or the general public. This concern led to epidemiology studies on selected populations, such as contractor employees, and a more comprehensive research program involving experimental animal, cellular, and molecular studies.

The Department's human genome program represents a new approach, based on modern biology and technology, to the more than forty year old mission of evaluating effects of low doses of exposure to energy-related agents. The knowledge that will flow from this program will open new levels of understanding about the effects of radiation and chemicals on the most fundamental level of life--the DNA molecule. Combined with the increased understanding of biological structure and function provided by research in structural biology, the results of these research activities are providing and will continue to provide methods, data, and processes for biotechnology applications. Potential applications include new drug designs, protein engineering of enzymes and other catalysts for industrial processes, diagnostics for medical diseases, and applications of biotechnology for environmental restoration.

The environmental research program, in a similar manner, evolved from an initial need to understand the pathways of radioactive materials from weapons testing through atmospheric, marine, and terrestrial environments to human exposure. The research base established within the DOE environmental research program has helped provide a quantitative understanding of the processes that affect the environmental fate of energy-related materials and, thus, has enabled DOE to respond effectively to recent national concerns such as acid rain and possible global climate change from the increase of carbon dioxide and other greenhouse gases. Important research related to subsurface contamination and ground water is also underway and is expected to contribute significantly to environmental restoration activities.

The Department's research in medical applications also evolved from the original mandate to promote the use of radioactive materials for medical applications. As progressively sophisticated applications for diagnosis and treatment of diseases evolved, nuclear medicine became a recognized medical specialty and radionuclide production developed into a flourishing industry. The Department's research in this very important field of medicine continues to produce new information and technologies that make possible more effective and safer ways to diagnose and treat a variety of diseases, including cancer and heart disease.

FY 1991 BIOLOGICAL AND ENVIRONMENTAL RESEARCH BUDGET REQUEST

The FY 1991 budget request for the BER program is $338.8 million. Of that amount, $323.7 million is for Operating Expenses, $11.6 million is for Capital Equipment, and $3.5 million is for Construction. (Table 11).

The Health Effects research activity, with an FY 1991 Operating Expenses request of $73.1 million, will provide for continued research in epidemiology, radiation biology, and chemical toxicology. This research will provide the information needed to correlate the relationships between exposure to chronic, low levels of chemicals or radiation and the consequent biological response. In addition to increasing our scientific understanding of these relationships, results from this research will continue to provide input to occupational exposure standards and, ultimately, will lead to healthier and safer environments in the workplace.

The epidemiology research supported by the BER program is concerned with the health consequences of energy production and use as well as the consaquences of working at or living near DOE facilities. Extensive data bases on the

Table 11
Energy Supply R&D
Biological and Environmental Research
Budget Authority
($ in millions)

	FY 1989	FY 1990	FY 1991 Request
Operating Expenses			
Late Effects on Health & Environment of Energy Development and Use			
Analytical Technology	$ 14.2	$ 15.2	$ 17.0
Environmental Research	36.3	40.5	44.7
Health Effects	64.9	71.5	73.1
General Life Sciences	45.4	56.2	80.2
Medical Applications	36.1	37.3	37.0
Carbon Dioxide Research	17.4	50.0	65.9
Program Direction	4.0	4.5	5.8
Subtotal	$ 218.3	$ 275.2	$ 323.7
Capital Equipment	9.0	11.3	11.6
Construction	23.5	22.2	3.5
Total	$ 250.8	$ 308.7	$ 338.8

Department's contractor worker population have been compiled in connection with studies of chronic exposures to ionizing radiation. In response to the need to organize and integrate data from these studies, as well as data on other DOE worker populations living near DOE facilities, and on other populations such as workers in the energy industry, the FY 1991 request includes a continued effort to develop the Comprehensive Epidemiologic Data Resource (CEDR). This resource will be available to all qualified epidemiologic research investigators.

The CEDR, which is one element of the Secretary's four-point epidemiologic initiative, will be a national database containing validated data useful for epidemiologic research. A draft of the CEDR program plan has been completed; working groups have been formed to develop full implementation plans; an interim version of the CEDR, containing some data for dissemination, has been completed; and acceleration of activities to complete data collection on DOE workers has begun. While we expect to have intermediate versions of CEDR available for dissemination during the development process, full implementation is scheduled for the end of FY 1995. A major programmatic review of the Department's epidemiologic research activities was started in 1989 by the Secretarial Panel for the Evaluation of Epidemiologic Activities. The Interim Report of the Panel to the Secretary was received in November, 1989. The Panel made a number of recommendations, including several related to the release of data on DOE workers to researchers outside of the Department. The Department is in the process of addressing the Panel's recommendations.

The FY 1991 Health Effects request also provides for continuing the basic scientific research needed to understand and predict the health risk associated with exposure to indoor radon. This research includes determining the availability and transport of radon in the environment and its behavior indoors. It also includes measuring and characterizing human exposure to radon more accurately, better defining health risk estimates, and determining the role of radon exposure in combination with smoking in causing lung cancer. Estimates of the risk of incurring lung disease from exposure to radon are derived from experience with exposures in uranium mines. Further research, which will include animal exposure studies and extension of current studies from model indoor systems to real residences, could have implications for what are currently considered to be the exposure levels requiring corrective actions.

The FY 1991 request for General Life Sciences research is $80.2 million. This program will continue to emphasize molecular and cellular studies to examine how key biological processes operate, as well as studies of the structure of key macromolecules like DNA. Using this knowledge, researchers can learn more about how physical and chemical agents affect living processes. The research also identifies early indicators of biological damage, teaches us how cells repair themselves, and leads to new techniques for analyzing biological damage.

Much of the damage to DNA that is caused by radiation and chemicals is repaired by the body's own built-in defenses. This repair process has important implications for accurately evaluating the risks and potential health impacts of these agents. Advances in our understanding may even have considerable potential for therapy. Progress has been made during the last year at LLNL, LANL, and ORNL where researchers were able to isolate specific human genes involved in the repair of DNA damage caused by ultraviolet light and certain types of chemicals.

A major FY 1991 focus in General Life Sciences research will be the DOE human genome effort which is developing new instrumentation and methodologies that will make research on the molecular structure of the human genome, which is the complete set of genetic instructions that make a human being, less costly and less labor intensive. The FY 1991 request of $45.9 million expands human genome research aimed at developing improved technologies for sequencing DNA, constructing physical maps of each human chromosome, developing computational capabilities for analyzing and manipulating data, and facilitating technology transfer. During the last year, progress has been made at LANL, LLNL, LBL, and the University of Chicago, respectively, where scientists have developed: a new physical mapping technique currently in use in mapping chromosome 16, an automated technique being used to map chromosome 19, a common language that would allow all physical maps of chromosomes to be described electronically, and a new method of cutting human DNA into fragments that will greatly facilitate chromosome mapping. Also during the last year, DOE and the National Institutes of Health (NIH) completed a five-year plan for the national human genome program which DOE and NIH jointly plan and carry out. The DOE portion of the program focuses on developing technical capabilities and tools, while the NIH effort is oriented toward characterizing disease-oriented genes, through use of both human and non-human model systems.

The FY 1991 request for Analytical Technology is $17.0 million. This request will provide for research directed at developing new and more sensitive instruments to make physical, chemical and biological measurements of energy-related emissions. These instruments will also assist scientists in measuring human exposure and biological response to those emissions. These more precise measurements are crucial to further progress in understanding indoor radon, as well as damage to DNA and to the environment from energy-related missions.

The FY 1991 budget request for Environmental Research is $44.7 million. This research activity, together with the Carbon Dioxide Research activity, which I will discuss next, provides information needed to address a number of important issues, including atmospheric chemistry, global climate processes, the resiliency of ecosystems and marine coastal areas to energy activities, and environmental restoration around DOE facilities that have been used for energy and weapons-related operations and R&D.

The Environmental Research request will provide for continued research aimed at determining how energy-related agents move through and are changed by the atmosphere, oceanic and terrestrial ecosystems, and how they ultimately affect humans. Scientists are also looking at how the environment itself may be affected by energy-related activities and how negative effects can be mitigated.

The FY 1991 request will also support a series of major field studies of the processing of sulphur and nitrogen oxides by clouds and precipitation, and the mechanisms by which they are deposited on sensitive ecosystems. This work will contribute to a more informed approach to possible emission control strategies aimed at addressing the acid rain problem.

Long-term research directed at contamination of subsurface sediments and ground water by mixed wastes from DOE sites will also be carried out. This research provides the underpinning for cost-effective management and remediation of contamination from the Department's energy and weapons-related project wastes. One example of the productive results stemming from research in this area is the recent development at Pacific Northwest Laboratory of an innovative sensor for detecting liquid contaminants such as fuel oil or solvents within soil. This sensor is less expensive, simpler, and more accurate than existing sensors, and the technology is now available to industry for commercialization. In FY 1991, research related to subsurface contamination will be directed at improved environmental measurement technology and at physical, chemical, and biological interactions that control the transport of mixed contaminants. Research on biological remediation techniques using microorganisms found at depths of up to 2000 feet also will be emphasized.

Another very important research area in FY 1991 relates to possible global change from the increase of greenhouse gases and, especially, from carbon dioxide. The Department's Carbon Dioxide Research program, for which the FY 1991 budget request is $65.9 million, is the principal DOE activity in the U.S. Global Change Research Program organized by the Committee on Earth Sciences (CES) of the Office of Science and Technology Policy. The Secretary of Energy has identified global climate change as an important environmental consideration in the development of the National Energy Strategy. Consequently, DOE has launched a major research initiative to provide the scientific underpinning for prediction of global and regional climate change. A principal component of this initiative is an experimental program to quantify cloud formation processes. Using measurement and modeling techniques, researchers will examine the roles of clouds and their effect on the sun's naturally occurring radiation (i.e., the radiative effect) in climate change. The information gained from such research is essential for improved prediction. A second component is an effective integration of advanced computer hardware and software with the next-generation climate models in order to accelerate computer operations by a factor of 10,000 within the next ten years.

The program will continue to seek multidisciplinary input from the scientific community to gain a broad perspective. Climate change research activities throughout the Department are being coordinated by the Office of Energy Research, with interagency coordination being implemented through the CES. International activities are coordinated through such organizations as the Intergovernmental Panel on Climate Change.

The Medical Applications activity, with an FY 1991 budget request of $37.0 million, carries out a wide range of projects aimed at the beneficial medical application of energy-related technologies. Over the years, the Department's medical research has provided information that has led to the widespread use of nuclear technology in modern clinical and laboratory medicine, opening avenues of diagnosis and treatment that otherwise would not have been available. Research in FY 1991 will focus on non-invasive diagnosis and treatment techniques, development of improved instrumentation, and improved methods for studying brain and heart function and for diagnosing abnormalities in these organs. For instance, studies using Positron Emission Tomography, commonly known as PET scans, have identified areas in the brain that are most affected by alcohol and cocaine. These studies provide information about the neurochemical mechanisms through which these substances act on the brain. Further studies will be directed to determining whether it is possible to recover from the damage that is produced. Another use of PET scans is to locate the lesions in the brain that cause epileptic seizures. This information is useful as a guide to surgical treatment. PET scans can also help to determine which patients will benefit from coronary by-pass surgery.

The FY 1991 request for Program Direction is $5.8 million. These funds are required to pay for the personnel costs of 65 full-time equivalent (FTE) staff to direct, manage, and support BER's multidisciplinary research efforts. The FY 1991 request for Capital Equipment is $11.6 million. This request supports replacement of deteriorated and obsolete equipment at the laboratories as well as acquisition of new, state-of-the-art equipment, particularly for human genome and carbon dioxide research.

The request for Construction in FY 1991 is $3.5 million. The General Plant Projects that fall under this request are necessary to keep the general plant of the laboratories (e.g., buildings, roads, and utilities) in good operating condition.

Now let me turn to the several ER programs that are related to my statutory responsibilities to advise the Secretary on DOE's research and development programs, on the non-weapons multiprogram laboratories, and on the education and training of scientists and engineers.

ENERGY RESEARCH ANALYSES

The Energy Research Analyses (ERA) program carries out technical assessments and research analyses that cover all aspects of the Department's civilian R&D programs. These in-depth reviews provide information on the quality of the research and its impact, as well as identify opportunities for future research. In 1989, reviews of the Photovoltaics, Flue Gas Cleanup, and Chemical Toxicology programs were completed. A major research needs assessment on coal liquefaction was also completed and will provide valuable information to help guide the program for the next several years.

In addition to carrying out technical assessments and analyses, the ERA program plays a key role in coordinating the Department's involvement in acid rain research. Specifically, the program provides funds under the National Acid Precipitation Assessment Program (NAPAP) for summarizing the state of the science in acid rain research and producing assessment reports useful to policymakers. ERA's emphasis on technical peer reviews has made a major contribution to NAPAP's final report which is being prepared in FY 1990 and will be completed in FY 1991.

The FY 1991 budget request of $3.7 million will provide funding for peer reviews and technical assessments of programs in the Office of Energy Research, as well as programs under the Assistant Secretary for Fossil Energy and the Assistant Secretary for Conservation and Renewable Energy. In addition, funds will be provided to assess responses to the final NAPAP report and to continue to monitor interagency research results related to clean air issues.

UNIVERSITY AND SCIENCE EDUCATION

There is a growing consensus that one of the most serious problems facing the Nation over the next ten years is the declining number of young Americans, including women and minorities, interested in pursuing careers in science and engineering. Those who are interested often receive inadequate preparation for such careers. This crisis in science education has serious implications for the Nation's continued international economic and technological competitiveness. It also has implications for the Department's ability to carry out its science, energy, and defense R&D missions.

The Department is both a user and a patron of a large fraction of the Nation's scientists and engineers. To meet the challenges facing the Department today and in the future, we have to depend on the scientific creativity and technical skills of our workforce. DOE is uniquely positioned to provide major assistance to the national effort to strengthen science and engineering education. The Department's long tradition of support for science education continues today. Several of our laboratories have been designated as Science Education Centers and are carrying out comprehensive science education programs. Our efforts complement those of the National Science Foundation, the Department of Education, and other Federal agencies, state and local governments, and the education community by providing students and their teachers with "hands on" experiences in ongoing, cutting-edge scientific and technical research.

Secretary Watkins has made support for science education a personal and Departmental goal. He was an active participant in the President's Charlottesville Summit Conference. Last October, shortly after the Conference, the Secretary and Nobel Laureate Glenn Seaborg cohosted a Math/Science Education Action Conference in Berkeley, California. Over 200 senior representatives from Federal agencies, Congress, education associations, States, industry, and the National Laboratories met in working groups to formulate the outline of an action plan to improve science education dramatically by the year 2007.

The FY 1991 budget request of $29.7 million for University and Science Education reflects, in part, the Secretary's and the Department's commitment. (Table 12) This request will continue the existing base programs, including undergraduate student summer and semester research programs as well as faculty and graduate student research activities. The FY 1991 request will also include new activities responsive to the Secretary's Math/Science Education Action Conference and to recent reports including the Energy Research Advisory Board's report on the Department's potential role in science education; the Interagency Task Force on Women, Minorities, and the Handicapped in Science

Table 12
Energy Supply R&D
University and Science Education
Budget Authority
($ in millions)

	FY 1989	FY 1990	FY 1991 Request
Operating Expenses			
Laboratory Cooperative Science Centers	$ 11.2	$ 11.9	$ 18.2
University Programs	6.8	6.8	1.9
University Reactor Fuel Assistance	2.0	4.0	7.2
R&D Laboratory Technology Transfer	1.4	2.2	2.4
Total University and Science Education	$ 21.4	$ 24.9	$ 29.7

and Technology report, "Changing America: The New Face of Science and Engineering;" and the National Research Council report, "Everybody Counts."

Among the new initiatives in FY 1991 are inner city/rural partnerships designed to revitalize math and science education in targeted school districts. Another initiative will be the establishment of a precollege mathematics science education program at the DOE laboratories. There will also be: a traveling museum-based science education program consisting of exhibits on major energy-related scientific programs; increased precollege science teacher research appointments and minority high school student appointments to encourage more students to stay in the math/science pipeline; and emphasis on reaching students at a younger age, especially women and minorities, through the Prefreshman Engineering Program.

Two collaborative initiatives have already been announced that respond to this new emphasis on science education. The Chicago "Science Explorers Program" is a collaboration among ANL, Fermilab, the Chicago Public Schools, and a group of Chicago institutions involved in science education. The program is aimed at stimulating a high level of interest in science and math in 10,000 Chicago students. Another initiative is a cooperative program in math and science education between DOE facilities in Oak Ridge, Tennessee and the University of Tennessee. It will provide opportunities to college students who want to teach math or science, as well as to scientists and engineers or retirees who want to teach. A third initiative will begin this Spring and will involve the Pacific Northwest Laboratory in a collaborative science education program impacting the Hispanic and Native American populations, with another initiative expected in New Mexico using DOE facilities there.

The FY 1991 University and Science Education program will continue to provide support for refueling and related activities for university nuclear research and training reactors.

The R&D Laboratory Technology Transfer program, which supports DOE laboratory efforts to spin off new technology to U.S. industry and universities, will also continue in FY 1991. Under this program, scientists from large and small industries work on assignment at DOE laboratories with laboratory scientists. This is a valuable interaction because new skills and technology are transferred on a timely basis through cost-shared arrangements. The value of these interactions in terms of technology transfer is illustrated by the fact that, in the last five years, DOE laboratories have won over 25% of the R&D-100 awards given annually by R&D Magazine for the best new products, processes, and materials.

UNIVERSITY RESEARCH INSTRUMENTATION

The University Research Instrumentation (URI) program provides another way to strengthen the Nation's science and education infrastructure. This program helps universities acquire the state-of-the-art instrumentation that is needed to conduct long-range research on energy problems. In the process, the program provides graduate students with hands-on experience in the use of this sophisticated research equipment. This annual, competitive program involves substantial cost sharing from the institution receiving the equipment.

The FY 1991 request of $4.9 million will assist universities in purchasing instruments that cost over $100,000 each and that will be used by a number of researchers, including students. In selecting approximately 20 proposals to be funded, special emphasis will continue to be placed on innovative instrumentation needed to carry out research on advanced topics in energy research.

MULTIPROGRAM ENERGY LABORATORIES--FACILITIES SUPPORT

The objective of the Multiprogram Energy Laboratories--Facilities Support program (MEL-FS) is to maintain the capabilities of the five national laboratories overseen by the Office of Energy Research to carry out their missions in a safe, healthy, and cost-effective manner. To accomplish this, the program supports activities that help counter problems of aging and obsolescence of facilities as well as safety and health inadequacies.

The FY 1991 Construction request of $23.7 million will support continuation of all ongoing projects. There are no new starts included in the request.

ADVISORY AND OVERSIGHT PROGRAM DIRECTION AND POLICY AND MANAGEMENT

The FY 1991 budget request for Advisory and Oversight Program Direction is $4.3 million. The FY 1991 request will provide the staffing resources required by the Director of Energy Research to carry out his responsibilities under legislation (P.L. 95-91) and those assigned or delegated by the Secretary in areas beyond the scope of other ongoing Energy Research programs. These funds are required to provide for the salaries, benefits, travel, and other expenses associated with 50 full-time equivalent employees.

The FY 1991 request for Policy and Management is $0.9 million. These funds are required to provide for the salaries and related expenses associated with 8 full-time equivalent employees in the Office of the Director of Energy Research.

That concludes my statement. I would be happy to answer questions.

Senator FORD. Thank you, Dr. Decker.

Dr. Schwitters, you may proceed.

STATEMENT OF DR. ROY F. SCHWITTERS, DIRECTOR, SUPERCONDUCTING SUPER COLLIDER LABORATORY, DALLAS, TX

Dr. SCHWITTERS. Thank you, Mr. Chairman. It is a pleasure to be back before you again and to be able to report to you on the activities of the SSC laboratory in its first year of existence. I have prepared a written status report that I would like to submit to the record.

Senator FORD. It will be included in the record.

Dr. SCHWITTERS. Thank you, sir, and I would like to now just summarize briefly that report. First of all, let me say, let me raise this question again that has been before us this morning, why do we want to build the super collider.

I believe that since humans first became curious about the world around them, they have sought answers to two basic questions: What are things made of and how do they work? Through history the answers to these questions have evolved over time, and we now have reached the stage at which we can describe what we know about the constitution of matter throughout the universe in terms of what is called the standard model.

All experimental evidence to date is consistent with that model, and yet the model itself is incomplete. We really know—again, it describes reality as we have been able to test it in our laboratories and our observations, but it is unable to describe the why of that reality, and particularly this issue of the basic origin of mass which is really one of the most basic questions of the substance of substance.

Therefore, the next step in this historically important and intellectually exciting quest is to gain new experimental information to be able to guide us beyond our present understanding to a much deeper understanding of the standard model and its inner workings. T.D. Lee, a colleague of ours and Nobel laureate in physics has said, "Our aim is to understand that set of laws which governs everything." The SSC makes a direct route toward achieving this understanding. It will be our contribution to the civilization of the next century.

When President Reagan announced his intention to proceed with the construction of the SSC, he signaled this country's resolve to remain a world leader in the search for knowledge and understanding. His announcement changed the nature of the SSC from a conceptual effort to understand the design of a next generation accelerator into a project with the goal of creating the world's most powerful accelerator and the world's premier high energy physics laboratory.

In January of last year DOE chose Universities Research Association, a consortium of 77 of our leading research universities in this country, to serve as the management and operations contractor for the SSC with responsibility to build and operate the new laboratory. We have been in existence now just over a year, and I would like to tell you about some of the accomplishments that have taken place in that time. When formed last year and indeed in our discussions before your committee last year, I listed a number of the objectives, and I am happy to report that many of those are now successfully completed.

Our first job was to mobilize near the site in Texas. We have done that. We have built and occupied temporary quarters. The staff is growing. It is a very exciting, dynamic group with over 500 people on board now from literally a green field start a year ago.

Our principal effort that you have heard about this morning and I want to go into in more depth and, again, the report I made last year was that we wanted now with responsible engineers and scientists to go into depth, a review of the original conceptual design and apply that to the actual site in Texas and from that develop the necessary cost and schedules that go with that. We call that the baseline design, and it is has been our principal activity.

Associated with that we have performed various geological investigations. We have done work in supporting the environmental impact statement. As you have heard, we have selected an outstanding architect engineering firm to assist us with the construction and engineering of the facility. A major technical effort has been and continues to be the development of the superconducting magnets, and we are also beginning to initiate the scientific programs in the laboratory.

Now, let me address this issue of the baseline design. This has been our most important activity over the first year. The central design group which prepared the original design in 1986 did an excellent job of giving us a foundation for this machine. However, since that time, the 3 years that have transpired since that original conceptual design report was completed, there has been considerable new information available to our accelerator designers. First of all, we have the Tevatron. It is the first large superconducting accelerator, and it was really only after the original design report that we had considerable operating experience in the storage mode.

In addition, other accelerators at CERN and in Germany have provided more information about the behavior of particles stored in these accelerators. We have applied that new information to the design of the SSC, and that has resulted in our recommended figures of the 20 TeV energy, the high luminosity, the 2 TeV injector, and the force changing from 4 to 5 centimeters on the aperture.

The recommended design was accompanied by a very careful cost estimate. This is the first cost estimate, I should point out, prepared for the SSC on an actual site. The laboratory worked closely with DOE and continues to work closely with DOE to develop a precise and agreed upon cost estimate that we intend to commit our reputations to and our whole effort to as we go forward with this project.

I want to be very clear about something here. Although the figure will be higher than the $5.9 billion talked about last year and submitted with the President's request, it does not in any sense constitute a cost overrun. It is the first true cost estimate for the project as it is proposed to be built. It came out in the questioning earlier today. We have examined in detail the reasons for the higher number. About half of the difference is due to the design changes that I mentioned before that, again, we felt were required to ensure the proper operation of this immense investment that we are making well into the next century to be able to provide the scientific tools and reliable operations that we need for this kind of facility.

The other half of the difference comes from revising the technical and economic assumptions and various labor rates and so forth that went into the design. It has been recognized for some time now that a principal technical challenge facing the SSC, perhaps the principal challenge, is the design and production of the large superconducting dipole magnets that will guide the beams of protons around the ring.

The challenge here is one of scale, not concept. Superconducting magnets have been built and used in accelerators around the world. Under the auspices of the central design group at Berkeley, a magnet research and development program was begun a few years ago to turn the proven concept of superconducting magnets into the cost-effective design for the SSC. A number of mechanical and electromagnetic designs were developed and tested at our national laboratories. To date, 14 full-length magnets have been built and tested.

We now know that we can build these magnets that achieve the required field strength at the operating temperature of 4 degrees Kelvin. One important characteristic of the magnet, their quench performance—this is the way they behave when the superconducting materials become normal—has been demonstrated to be satisfactory. The mechanical and cryogenic performance meets our requirements.

Over the life of the magnet R&D program the design of the magnets has evolved as new and improved ideas about the mechanical and electromagnetic performance has been incorporated into the design. However, as I mentioned earlier, one change in the baseline design was recommended by accelerator experts and adopted late last year. That was the change of the inner coil diameter from 4 to 5 centimeters. This change, reflecting an improved understanding of the field quality in the magnets and the behavior of protons in the magnetic field was sensible and conservative, one whose goal is to create a more reliable accelerator.

I have established a task force at the laboratory to incorporate the modification in magnet aperture in the baseline design. The task force is progressing well. The new magnet cross-section has been established, and magnetic and mechanical design for the 5-centimeter magnet is complete. With the demonstration in the testing program of satisfactory field strength and mechanical performance, the emphasis of the SSC magnet program now shifts to two areas: field quality and manufacturability. These will be the focus of the next year's program.

As I have often stated, the SSC really has two major goals. Our first goal is to create the world's premier high energy physics laboratory by the year 2000. And our second goal is to create a major national resource for science education at all levels.

In the remaining couple of minutes here I would like to tell you a little bit about our efforts in the second area. We have just announced in the laboratory, with the State of Texas, the award of the first SSC national fellowships to 20 outstanding young scientists to help them pursue their studies at universities all around the country related to the SSC. Funds for these fellowships are being provided by the Texas National Research Laboratory Commission but, again, as I say, the people involved are from across the country, and it is very exciting to begin already to see the young scientists getting involved in this program. They are going to be the leaders in ten years when we have completed this machine, and they are the people who will be making the discoveries.

Beyond the fellowship program we are working with local educational people in our communities to see how right from the beginning we can use our resources and all the interesting engineering tools, construction activities, magnets and research that can be part of, again, a national resource in education starting right from the beginning, before we even begin the research programs of the laboratory.

Let me conclude by saying the SSC laboratory is off to a very exciting and productive start. We must now maintain the momentum of the first year by vigorously pursuing our magnet development program, carrying out the design and testing activities at the site, planning the initial experimental program and building on the foundation of educational programs we have begun to implement. Thank you very much.

[The prepared statement of Dr. Schwitters follows:]

SSC Status

Prepared testimony of Roy F. Schwitters, Director
Superconducting Super Collider Laboratory

before

Subcommittee on Energy, Research, and Development
Committee on Energy and Natural Resources
U.S. Senate

April 24, 1990

STATEMENT OF

ROY F. SCHWITTERS
DIRECTOR, SSC LABORATORY

Why do we want to build the Superconducting Super Collider? Since humans became curious about the world around them they have sought answers to two basic questions: What are things made of? How do they work? The answers to these questions have evolved over time and have now reached the stage at which we can describe what we know about the constitution of matter and the forces that affect matter in terms of what is known as the "Standard Model." All experimental evidence that has been gathered to date is consistent with the Standard Model and yet the model is itself incomplete, for while it does an excellent job of describing reality it is unable to explain why reality takes the form it does. The next step, then, in the long and intellectually exciting quest to understand our world is to understand the inner workings of the Standard Model and what lies beyond. T.D. Lee, a Nobel laureate in physics has said:

> Our aim is to understand that set of laws which governs everything. SSC makes a direct route toward achieving this understanding. It will be our contribution to the civilization of the next century.

When President Reagan announced his intention to proceed with the construction of the SSC, he signalled this country's resolve to remain a world leader in the search for knowledge and understanding. His announcement changed the nature of the SSC from a conceptual effort to understand the design of a next-generation accelerator into a project with the goal of creating the world's most powerful accelerator and the world's premiere high energy physics laboratory.

Through 1987 and 1988, much of the effort of the Department of Energy on this project focussed on finding a site for the SSC. The Department enlisted the help of the National Academies of Sciences and Engineering in part of the site selection process, and by January 1989 it had selected a site in Ellis County, Texas as the future home of the SSC.

Also in January of 1989, DOE chose Universities Research Association, a consortium of 77 leading research universities, to serve as the management and operating contractor for the SSC with responsibility to design, build, and operate the SSC Laboratory. Thus the

Laboratory has now been in existence for just over a year. I would like to report to you now about the accomplishments of the past year and about the goals and plans for the future.

When it was formed last year, the new Laboratory agreed with DOE on a number of important tasks to be undertaken in its first year. The Laboratory was to:

mobilize its effort near the Ellis County site,
develop a site-specific baseline design, schedule, and cost estimate,
perform geotechnical investigations and specify the SSC "footprint",
support preparation of an environmental impact statement,
select an architect-engineer/construction manager,
continue development of the SSC magnets, and
initiate scientific programs

This was an ambitious program, particularly for an enterprise that did not even exist just over a year ago, but I am pleased to report that the dedicated people that have come to work on this project have accomplished the short-term goals that had been set out for them.

Mobilize effort near the site

At the time that the SSC Laboratory was established, design and planning work on the SSC had been going on for several years at the Central Design Group located at the Lawrence Berkeley Laboratory in California. There, some 80 people had developed a conceptual design for the SSC and, working with scientists and engineers at Fermilab and at Brookhaven National Laboratory, had begun a research and development program to design the large superconducting magnets that will steer the proton beams around the collider ring. The fledging Laboratory established temporary office headquarters in South Dallas, incorporated the Central Design Group (inviting any of its staff that wished to come to Dallas to do so), and began recruiting staff.

At present, the SSC Laboratory has a staff of just over 500, organized in three project divisions (magnet systems, accelerator systems, and conventional construction), a physics research division, and a number of supporting and administrative units. The temporary headquarters have expanded to accommodate this staff, though the goal is to move to the permanent site in Ellis County as soon as possible.

Develop baseline design, schedule, and cost estimate

Perhaps the Laboratory's most important activity in its first year was the preparation of a site specific design and associated schedules and cost estimates. The Central Design Group had, in 1986, completed a conceptual design for the SSC but that design must be viewed as a hypothetical design located at a generic location because the site had not yet been chosen. Using the conceptual design, schedules prepared with the Central Design Group, and economic assumptions provided by the Office of Management and Budget, the Department of Energy generated a cost estimate for the project of $5.9 billion in then-year dollars.

In early 1989, the SSC Laboratory began its work on the design of the SSC, using as a starting point the 1986 conceptual design. The intervening three years had yielded considerable new information for the designers. An actual site had been chosen and could be incorporated in the design. Operating experience at other accelerators, most notably those at Fermilab, CERN, and HERA provided information about the behavior of particles in accelerators and the performance of superconducting magnets. And the SSC magnet research and development program was well along the path toward demonstrating the concept and design of the large superconducting dipole magnets.

The result of the design effort has been a recommended design for the SSC that proposes an accelerator with a beam energy of 20 TeV, luminosity of 10^{33} cm^{-2} sec^{-1}, injection energy of 2 TeV, magnet field strength of 6.59 T, magnet aperture of 5 cm, and tunnel length of about 54 miles. The recommended design provides for four initial interaction regions and includes tunnels that could be outfitted in the future to provide experimental bypasses. The major changes from the 1986 conceptual design are the injection energy (up from 1 TeV), the magnet aperture (up from 4 cm), and the bypasses. The first two changes were recommended based on careful analysis of the behavior of particle beams at other accelerators and on simulations of particle behavior run on supercomputers that showed that with the lower injection energy and smaller aperture the reliable operation of the accelerator could not be assured. To verify the interpretation of the new information and the correctness of the recommendation based on that information, the Laboratory asked its Machine Advisory Committee, a group of internationally recognized accelerator scientists and engineers, to review the data and provide an independent recommendation. The report of the Committee, made available in December 1989, urged strongly that the injector energy and the magnet aperture be increased.

The bypass idea was introduced to add a measure of flexibility in the experimental program of the Laboratory. In the 1986 conceptual design, all the experimental halls were placed along the collider ring, so that if any repairs or changes had to be made in a detector located in one of the halls the accelerator would have to be shut down. Bypasses provide a path for protons to travel around some of the experimental halls so that the accelerator can continue to run while work is being done on the detectors. We have recommended that the tunnels for the bypass be drilled (thus making most efficient use of the large tunnel boring machines while they are in place underground) but not outfitted in the initial configuration.

The recommended design was accompanied by a careful cost estimate, the first cost estimate prepared for a real SSC on an actual site. That cost estimate leads to a total project cost of between about $7.2 and $7.8 billion, depending on assumptions. The Laboratory staff is working closely with the DOE to develop a precise and agreed upon cost estimate that we intend to maintain as we build the supercollider. I want to be very clear about something here. Although this figure is higher than the $5.9 billion figure that had been associated with the 1986 conceptual design, it does not, in any sense, constitute a cost overrun. It is the first true cost estimate for the project as it is proposed to be built. We have examined, in detail, the reasons for the higher number. About half of the difference is due to the design changes mentioned earlier, design changes made necessary by the incorporation of technical information about the operations of accelerators that was not available at the time the conceptual design was prepared. The other half of the difference comes from revising the technical and economic assumptions that were used in the earlier estimate to provide a greater degree of realism. Thus, the current cost estimate incorporates what we feel are much more accurate labor rates and schedules than those that were part of the earlier estimate.

Understandable concerns have been raised about whether the new cost estimate presages further increases in the future. It does not. The cost estimate we have presented to the Department of Energy for its review is a conservative projection of the real costs of completing this project. High energy physicists, it must be noted, have had a good record in the past in completing projects on time and within budget. This was certainly the case at

Fermilab, this nation's largest and most ambitious accelerator project. It is my intention, and that of the rest of the SSC staff, to maintain the good record of the past.

Perform geotechnical investigations and specify footprint

The Texas site provides an excellent geological base for the SSC, but because the collider tunnel will be situated below the ground it is imperative that the designers and constructors understand the geology in great detail. To that end, the SSC Laboratory has been carrying out a program of geotechnical investigation since last spring. That program has given us a much more accurate picture of the underground structure at the site and that, in turn, has enabled us to determine the optimum placement of the collider ring, the so-called footprint.

Once the footprint was specified, the state of Texas was able to identify with great accuracy the land parcels that would have to be acquired and provided to the Department of Energy. The state of Texas is currently beginning the land acquisition process.

Support preparation of the environmental impact statement

Before any construction work can begin at the SSC site, a Supplemental Environmental Impact Statement must be completed. The SEIS provides a detailed, site-specific update to the final environmental impact statement that was completed by the Department of Energy late in 1988. The Department has assigned the task of preparing the SEIS to Argonne National Laboratory, though the SSC Laboratory is providing much of the needed information to the Argonne team. DOE's current plans call for a completion of the environmental impact statement process by some time this fall.

While it would be inappropriate to prejudge the outcome of the environmental impact statement process until it is completed, my impression is that the data gathering to date has not discovered any environmental problems of serious import. This is not so surprising; one of the attributes of the Texas site that was noted during the site selection process was the apparent absence of any significant negative environmental impacts.

Select an architect-engineer/construction manager

The construction of the conventional facilities at the SSC -- the tunnels, shafts, and above-ground structures and site improvements -- will be a major and complex enterprise. To carry out the detailed engineering design work and to manage the construction project, the Laboratory will rely on a contractor with experience in large construction projects with significant underground components. A careful selection process has led to the selection of the team of Parsons Brinckerhoff of New York and Morrison Knudsen of Boise, Idaho, in association with CRSS, Inc. of Houston, Texas to serve as the architect-engineer/construction manager for the SSC. We are just now entering contract negotiations with the PB/MK/CRSS team and hope to have a contract in place by late spring or early summer.

It is worth noting that although the PB/MK/CRSS team will serve as construction manager for the project, the actual construction will be done by other firms that will be selected and managed by the construction manager. We feel that the involvement of broad and experienced industrial design and construction firms strengthens the project considerably.

Continue development of magnets

It has been recognized for some time now that a principal technical challenge facing the SSC -- perhaps *the* principal challenge -- is the design and production of the large superconducting dipole magnets that will guide the beams of protons around the ring.

The challenge is one of scale, not of concept. Superconducting magnets have been built and used in accelerators around the world. But none have been of the size and strength needed at the SSC. Under the auspices of the Central Design Group at Berkeley, a magnet research and development program was begun a few years ago to turn the proven concept of superconducting magnets into a design for the SSC dipole magnet. A number of mechanical and electromagnetic designs were developed and tested by the Central Design Group, working closely with scientists and engineers at Fermilab and Brookhaven National Laboratory. The magnet R & D program was incorporated into the SSC Laboratory last year and the development and testing program continued. As one of my first acts as director of the Laboratory, I established an advisory committee to give me its frank and constructive criticism of the magnet program. That committee reported to me in June of last year, endorsing the basic approach of our R & D program and indicating a number of areas where we could make technical improvements to the magnet design. The Laboratory has implemented the committee's recommendations.

To date, 14 full-length collider dipole magnets have been built and tested at the national laboratories. We now know that we can build magnets that achieve the required field strength at a temperature of 4.35K. One important characteristic of the magnets, their quench performance (the way they behave when they go from superconducting to normal), has been demonstrated to be satisfactory. Mechanical and cryogenic performance meets requirements.

Over the life of the magnet R & D program, the design of the magnets has evolved as new and improved ideas about mechanical and electromagnetic performance have been incorporated in the design. The result, by mid-summer of last year, was a "baseline" design. However, as I mentioned earlier, one change in the baseline design was recommended by accelerator experts and adopted late last year; that was the change in the inner coil diameter from 4 cm. to 5 cm. The change, reflecting an improved understanding of field quality in the magnets and the behavior of protons in the field, was a sensible and conservative one, one whose goal is to create a more reliable accelerator. I have established a task force at the SSC Laboratory to incorporate the modification in magnet aperture in the baseline design. The task force is progressing well; the new magnet cross section has been established and magnetic and mechanical design for the 5 cm. magnet is complete.

With the demonstration, in the testing program, of satisfactory field strength and mechanical performance, the emphasis in the SSC dipole magnet development program now shifts to two areas: field quality and manufacturability. These will be the focus, if you will, of the next year's program.

The involvement of the national laboratories in the magnet program has been strong and will continue in the coming year. At Brookhaven at present six long magnets are in various stages of assembly and test as are a number of shorter magnets. Brookhaven is also working on instrumentation for cold measurements of the magnets. Four long magnets are in assembly and test at Fermilab, together with a number of short magnets. We expect that Fermilab will be a focus for the effort to incorporate the aperture change in the baseline design. Lawrence Berkeley Laboratory is working on development of the quadrupole (focussing) magnet design and tooling as well as on a superconducting cable test facility.

A large number of superconducting magnets will be required for the SSC. The design calls for 8076 collider dipole magnets, 1699 collider quadrupole magnets, 858 special collider dipole magnets, 127 special collider quadrupole magnets, 929 dipole magnets for the high energy booster, and 561 quadrupole magnets for the high energy booster. For all but the special collider quadrupole magnets, we will turn to industry for assistance in design and production.

Within weeks, we hope to release a request for proposal seeking an industrial contractor to work closely with the Laboratory in the development of the final collider dipole design. While the SSC Laboratory and the other national laboratories possess substantial technical expertise and experience in magnet design and assembly, the industrial contractor will contribute capabilities in manufacturability, tooling, and high-rate production. At first, the industrial contractor will work closely with us and with Fermilab to design and assemble prototype magnets as well as the tooling necessary to permit mass production of the dipole magnets. At its own installation, the industrial contractor will prepare a small number of prototype and preproduction magnets after which we expect to begin production of the more than 8000 magnets needed to outfit the collider ring.

As soon as possible, and certainly before the end of 1992, we plan to conduct string tests of the magnets and associated accelerator systems both above ground and in a small section of tunnel constructed at the Ellis County site. In addition to giving us confidence that the magnet development and industrialization programs are proceeding on course, we expect to learn a great deal from these tests about installation procedures and about the geotechnical environment in which the collider tunnel will be located.

Initiate scientific programs

It is an interesting aspect of the experimental program at the SSC that it takes about as long to plan, design, and build the large detectors that will be used to examine the proton-proton collisions at the accelerator as it does to plan, design, and build the accelerator itself. The large detectors are enormous and complex enterprises in and of themselves; a completed detector may weigh more than 40,000 tons and cost several hundred million dollars. Typically, large international teams of scientists and engineers collaborate in experimental detector projects at major accelerator laboratories and we expect the same to be the case at the SSC. Indeed, a few international collaborations are in the process of being established with a goal of proposing detectors for the SSC.

Understanding the results of high energy proton collisions at the SSC requires the development of a new generation of particle detectors capable of handling the large number of collisions expected. To this end, the SSC Laboratory has been supporting research and development on detector technology at a number of institutions throughout the United States. Scientists from Europe and Japan have been participating as well.

Two committees of internationally recognized particle physicists have been advising me about the appropriate scope of the initial experimental program for the SSC, that is, the complement of detectors and experiments that should be in place and ready to operate when the collider begins its operations in 1998. We have asked scientists throughout the world to prepare what we have called "Expressions of Interest" describing initial experiments and detectors by May of this year. The Laboratory's Program Advisory Committee will evaluate the submissions and make judgments about which ideas and approaches should be pursued.

Educational activities

As I have often stated, the SSC has two major goals: to create the world's premier high energy physics laboratory and to create a national educational resource. I have told you what we are doing to realize the first goal; let me now turn to the second.

We have just announced the award of the first SSC National Fellowships to twenty outstanding young scientists to allow them to devote a year of research to SSC-related science. Funds for the fellowships are provided by the Texas National Research Laboratory Commission, but the awards are truly national in scope. The twenty junior faculty members and postdoctoral research associates will carry out their research activities at their home institutions. The goal of the program is to encourage the best young physicists to work on SSC science as well as to strengthen high energy and accelerator physics programs at institutions throughout the country.

Scientists at the SSC Laboratory are already teaching a graduate-level course in accelerator physics, and we fully expect others to begin similar activities as time permits.

Planning is underway at the Lab for a summer intern program for interested college (and perhaps high school) students. The aim here would be to demonstrate to the students what working at a real scientific laboratory is like.

We have held a meeting of a number of science teachers at the elementary and high school levels to discuss their views about how the SSC can serve as a focal point for improving science education in our schools. For some time now many have bemoaned the sorry state of the American educational system, particularly in the sciences; we hope to do something about the problem by instituting programs for teachers and students. We want the teachers involved with us in the planning and implementing of the programs.

Finally, hardly a day goes by when at least one of the SSC staff is not out at a school or a public meeting, discussing the SSC with interested members of the public. Here we note an interesting phenomenon; people are as interested in hearing about the SSC and its program as our staff is in talking about it.

Near-term objectives

Having satisfied most of our intended goals for the first year of operation, we now turn to a new set of objectives to which we will devote our efforts in the coming months.

As I mentioned earlier, a key milestone in our magnet program is the accelerator system string test scheduled for 1992. Here we intend to connect 5 dipole magnets and one quadrupole magnet and the associated technical systems and examine their performance on the surface and below ground in a tunnel section. The goals are to demonstrate magnet and system performance under realistic conditions, to gain experience in magnet and systems installation, and to improve geotechnical information in a geologically complex section of the ring.

Campus planning, design, and construction will get underway. The staff of the SSC Laboratory has been occupying temporary space in South Dallas for the last year. The efficiency of our work, as well as the spirit and morale of the staff and of the citizens of Ellis County cannot help but improve if we can rapidly locate the focus of our activities at the permanent site of the Laboratory. At a minimum, we will begin site preparation for the accelerator system string test as soon as we can, presumably immediately following the Record of Decision on the Supplemental Environmental Impact Statement currently under preparation by the Department of Energy.

Identification of the initial experimental program will begin in earnest in the coming months with the receipt and evaluation of the Expressions of Interest.

Conclusion

The SSC Laboratory is off to an exciting and productive start. We must now maintain the momentum of the first year by vigorously pursuing our magnet development program, carrying out design and construction activities at the site, planning the initial experimental program, and building on the foundation of educational programs we have begun to implement.

Senator **Ford**. Thank you very much, Doctor. Dr. Decker, let me ask you two or three questions and then turn it over to Senator Johnston. Dr. Decker, how do you assess the probability that more new information may come along to cause another cost increase?

Dr. **Decker**. In my view we probably have seen the major technical surprises that could hit us. I personally do not see a very high probability of new information coming along that would cause us to change the design significantly from the direction that we are on right now.

Before we started this program, we did do a fairly extensive analysis of new technologies coming along to see whether or not there were any new things that—new accelerating techniques and so forth that might cause us to change the design, and the result of all of those studies were that there was nothing new on the horizon that could affect the design of this particular machine.

We did get a surprise with regard to new information that came from operation of Tevatron and from the building of the superconducting magnets for the HERA machine which you heard about earlier. But I do not expect any additional surprises.

Senator **Ford**. Well, it is a fact that we cannot say with certainty right now the cost of the SSC, is that not correct? We do not really know what it is going to cost.

Dr. **Decker**. Right.

Senator **Ford**. Do you have any idea when we will know?

Dr. **Decker**. Yes, sir. Our intent is to have a hard cost estimate for you by August.

Senator **Ford**. You are usually pretty good about giving it to us when we are out of session, you know. Seems to work that way all the time. [Laughter.]

Can you see about getting it to us the last of July or the 1st of September?

Dr. **Decker**. We will do our best.

Senator **Ford**. All right. Who is responsible for the cost of the project? In other words, who should be fired if the costs get out of control? Dr. Schwitters?

Dr. **Decker**. I am not sure that I want to answer the question this way, but I guess ultimately the Secretary of Energy is responsible for the cost of this project. But when you talk about firing, I am a little anxious, a little reluctant to answer that way.

Certainly the primary responsibility for carrying out this project rests with the SSC laboratory and Universities Research Association. We have responsibility in my office for monitoring the progress in the project, monitoring its costs, and we plan to carry out that responsibility in a very conscientious way.

Senator **Ford**. Do you believe that we can obtain significant foreign contributions while reserving the technology and manufacturing benefits for the U.S. industry?

Dr. **Decker**. Yes, I believe we can, although there are some difficulties for sure. If we seek substantial amounts of foreign contributions, which we are, obviously our first choice would be to get those contributions in the form of unrestricted cash grants. Now, that is difficult to obtain, I suspect.

The most likely way that we feel that foreign countries will wish to contribute is through in-kind contributions. And if you look at where you may be able to obtain significant amounts of money through in-kind contributions, you do get into areas like the superconducting magnets because that is where there is a large chunk of project cost. But we are very concerned about ensuring that the benefits of building things like the superconducting magnets and other high tech components are gained by U.S. industry.

Senator FORD. Well, let me ask you this, then. You heard Dr. Bromley say or give what he understood to be the administration's position on Congressman Roe's H.R. 4380. That is the way you judge that bill also?

Dr. DECKER. Yes, sir.

Senator FORD. Dr. Schwitters, in your testimony—I am not sure which page it is on. I believe it is page 4—I have been looking at it a little bit, but it is understandable concerns have been raised about whether the new cost estimate gives pause for further increases in the future, and you say a flat does not. You know, how can you rule out any new information such as your experience with magnets and so forth and say there will be no more than that?

Dr. SCHWITTERS. These tough technical issues we have dealt with that have led to the substantial increase, the aperture and the energy of the injector, were known by accelerator designers to be the key points, even in the time of the central design group work. One has to make in the end technical judgments in these areas.

Now, you are right. There is new information that came available, new uses of supercomputers and so forth. We believe that that information is sufficient to describe the technical needs of the facility, and we believe there is enough experience in developing the development plan to produce these magnets that we can arrive at a figure—again, working with the department this spring and summer—that we will commit to.

Now, let me say a little bit about this.

Senator FORD. That you will commit to?

Dr. SCHWITTERS. yes, sir.

Now, let me say a little bit about this—my feeling of responsibility in this area. You asked who would get fired. We feel at the laboratory a very deep responsibility to the American people because of the trust in us to do this science, to our colleagues throughout science because this is a very major issue, and to our colleagues within high energy physics. Our goal is to do research with this wonderful instrument that you and the American people will make available to us.

This sense of responsibility has guided high energy physics very well in the past. We have had an excellent record of cost control in our major laboratories and an excellent record of performance in achieving our scientific goals. This is very deeply embedded in our—again, the sense of responsibility and trust between the community and the government, and I just want to put myself on record as signing on to that.

Senator FORD. Well, I understand your fervor here and your commitment, and you are to be commended for that. Dr. Bromley said earlier one of the problems you have in making estimates were conservative in making those estimates, and the very next sentence on page 4, the cost estimate we have presented to the Department of Energy for its review is a conservative projection of the real costs of completing the project.

Now, that statement in itself when you present a cost for review, it is conservative. It is on the low side, and somehow or another that disturbs this Senator that when it is on the low side that when final figures come in and bids are awarded or that sort of thing that is something you will not have control over. That we get into the problem of you just committed yourself to a figure. Well, I am not sure we all have that much control.

Dr. SCHWITTERS. Let me try to explain that. You are quite right, and it is precisely these issues of, again——

Senator FORD. Uncertainty.

Dr. SCHWITTERS [continuing]. Incomparables and uncertainty in those aspects of the cost estimate. And I want to—really I am saying commit within, again, a reasonable understanding with the department and you on those kinds of figures because inevitably there will be uncertainties on bids and so forth.

What we want to put in place, though, is a very clear statement of what is there, what is not there, what the assumptions are and so that we are all playing on the same field.

Senator FORD. I understand what you are confident with the management now that has been put together, and let me ask you this. I asked Dr. Bromley—I went back and asked him a final question, and so let me ask you. How much magnet testing is planned before major construction is done, and what is the test schedule?

Dr. SCHWITTERS. The next stage is to bring industry on board on these magnets. We have working with the department the first request for proposals—it is in draft form—that we expect soon to get out for industry comment. We hope later this year to bring our first development industry on board, as you heard, to build the first roughly one eighth of the magnets. That is the development contract leading to the tooling and methodology to build the full 8,000 dipoles.

That program goes itself in stages. For example, the first stage will be 12 magnets built with industry side by side with the development folks up at Fermilab. Then industry will build the next 15 in its facilities. Going beyond that, then we—every case we have a design review, we carefully watch again performance, costs, schedule and so forth. The next stage will be a pre-production batch of 100 magnets. We will watch that very carefully and look at—again, you have a precise set of design reviews and so forth. And finally, we will build approximately 500 magnets in the next stage, beyond that to verify the production.

So, we are continuously watching that as we go into the full rate production of the magnets with——

Senator FORD. What is your time frame from the first one to the 500?

Dr. SCHWITTERS. First to 500 I believe is about three years. I have to——

Senator FORD. That is all right. Just ballpark, that is fine because the first few, you had a dozen.

Dr. SCHWITTERS. That is right.

Senator FORD. Then you keep—and then you go out to 500.

Dr. **Schwitters**. You keep working through that. Now, you say construction. Again, in a project of this scope one, of course, has to do many different activities in parallel and to mesh the project together in the most cost-effective way.

Senator **Ford**. The fear I have here is that this is new. You have never built one like this before.

Dr. **Schwitters**. You have got it.

Senator **Ford**. Everything—so, there is a ghost behind every tombstone. Things are going to be popping up all the way, things that you did not understand. My concern is that it may—the dollars may pop out here, and we all will be concerned about it and surprised.

Dr. **Schwitters**. Yes, sir.

Senator **Ford**. Somewhere along the line we have got to be convinced about the scientific results that it would be worth whatever the price is. Dr. Bromley said there probably would a level at which he would reconsider the project, but he did not have the figure for us this morning. You have a figure at which you would like—you would say that when it goes beyond that, we should reconsider the project?

Dr. **Schwitters**. Let me say—first of all, let me say that in the planning process, of course, our business is the business of the unknown. Ultimately it is the research we are doing. But at the engineering level we build in, again, these check points, reviews, contingency on time and to be able to understand problems and so forth. We also build in contingency into the budget process itself, into the costing process.

So, that is what I say again. In that context, we are very committed to these figures and the overall program on that. Now, in terms of the—you asked at what point do you go no further. I guess from my perspective on the scientific front is that I view the one truly non-renewable resource is a person, a creative person's time, and our young people and the whole people involved in this, and I will give you, again, a very personal heartfelt view that if we start stretching beyond the sensible careers of the creative people that we need to make this thing what we all want it to be, that is when I think we have to seriously start reconsidering whether that is a wise investment.

Senator **Ford**. Thank you, Dr. Schwitters. Mr. Chairman?

The **Chairman**. Dr. Schwitters, I understand you have built a number of—well, you have built 15 full-length and many short magnets that have been built and tested in the National Lab, and a main-line design was chosen early in fiscal year 1989 and five such magnets have been built and tested to date, is that correct?

Dr. **Schwitters**. Yes, of the 4-centimeter design.

The **Chairman**. Now—that is the main line design?

Dr. **Schwitters**. That is right, and we are scaling from that design now to the new 5-centimeter aperture.

The **Chairman**. All right. So we never have built the 5-centimeter aperture?

Dr. **Schwitters**. That is correct. We will have our first short prototype versions of that at the end of this year and again we are taking, though, the design information, the engineering information and essentially scaling up the mechanical design to the new 5-centimeter aperture.

The CHAIRMAN. Now, when you go from the 4 to 5 centimeters, do you just take every dimension and increase it?

Dr. SCHWITTERS. To a good approximation, that is what you do. Now, it turns out that you do not want to do that for the outer jacket of the cryostat for other reasons, but you can think of it as almost like putting it on a piece of xerox and expanding it by a ratio of 5 to 4 in your Xerox machine.

That has one—by the way, one very natural benefit. That gives you what is called more margin. It makes, again, the magnet be able to perform at its high field in a more reliable fashion, just by virtue of that scaling property.

The CHAIRMAN. Right. Well, of these five main-line, 4-centimeter aperture magnets, three have worked perfectly well, one had human error, design errors or manufacturing errors, one had quench problems, or something.

Dr. SCHWITTERS. Yes. Yes, sir, there are—again, let me say a little bit about that program. The emphasis up until now has been to understand the mechanical details, the forces, or the tremendous forces that want to take these wires and expand them apart. That part of the program now is well understood. There are measurements of the force loads and levels inside there.

What we are seeing in a couple of instances, I would say, are the next level of what I call system errors. As you say, there is human error involved in assembling the wire that came into one magnet. Just last week we had another case where one of the internal components slightly overheated. It damaged some insulation. This is an example now where, in my view, one needs to rely on industry to be able to use the system engineering approach and the manufacturability approach to go now beyond the conceptual scientific design into the full product development, and this is why it is so important for us to learn——

The CHAIRMAN. Well, my question really is, Can you give the specifications blueprints, if you will, to industry and say, build this, or do you give them sort of a general idea of the blueprints and also give them some engineering requirements of what this thing will do after it is built?

Dr. SCHWITTERS. The answer is the latter. We are entering a development program of the roughly 1,000 magnets. We give them blueprints where we stand. We give them engineering information and general specifications. Then we work with them as a team to develop the precise blueprints and methodology that then we insist be followed as we build the subsequent 7,000 magnets.

The CHAIRMAN. Now, you heard Dr. Bromley state that he thinks 25 or so should be given to industry to build and not just assembled. Would you like to agree or disagree with Dr. Bromley on that?

Dr. SCHWITTERS. Well, as I indicated in the early question, in fact that is part of the program. We work with industry first to be able to transfer the laboratory information and experience. We then build batches of these in the industry, in batches of—again, the numbers are slightly different, but they are essentially the same. The first 25 are built, in fact, roughly half and half, side by side in the laboratory and then completely in the industry, then we go to a batch of 100 and 500. So I do not disagree with the step by step aspect of it. What we have developed, and are working with——

The CHAIRMAN. As I understood you, though, the first 12 are going to be built by the National Labs, in effect, with industry sort of looking over their shoulder.

Dr. SCHWITTERS. No. No, in fact we are building those in the National Lab now. In fact, it is the opposite. We bring industry on board to use tooling that we believe is developed in a way that is consistent with industry needs, and we—in fact the National Lab people look over industry's shoulders for that first 12.

The CHAIRMAN. For that first 12—and that is on-going right now?

Dr. SCHWITTERS. No. That program is just—we have the request for proposals under consideration with the Department, and we hope to bring that contractor on board late this summer.

The CHAIRMAN. Late this summer?

Dr. SCHWITTERS. Yes, sir.

The CHAIRMAN. Now, that was ready to go in March of this year, was it not?

Dr. SCHWITTERS. It has been in draft form, and again we are discussing with the procurement experts between our shop and the Department of Energy.

The CHAIRMAN. What is the delay in that? Is that because of foreign participation, trying to decide what they will do?

Dr. SCHWITTERS. That has not been an aspect of it. It was really the details of the RFP in terms of the selection procedures, statement of work and those contractual details.

The CHAIRMAN. If you do foreign participation, at what point do they come in?

Dr. SCHWITTERS. It seems to me it is going to depend a lot on exactly the details of the participation. I believe that it could be done in certain ways on a laboratory to laboratory collaboration, working with our development teams on this side and then possibly the foreign laboratory working with development teams in its industry and its host country, so one could imagine that participation at the development level.

At the production level, one would imagine, having derived this set of specifications and drawings, if we got into this and then making that the responsibility of a participating country. Now, what that means, and it is inevitable, is that it is a more complex management issue. One would have to have teams of our experts inspecting production, making sure all the details were done just right, because we cannot stand green and red magnets. I mean, they have got to be the same. They have got to work.

In fact, one of the interesting experiences in this going on right now is with the German project at Hamburg. They have built a new superconducting accelerator. It is roughly the scale of the Tevatron. Half of the magnets were built in Germany and half were built in Italy, and in fact they find minor technical differences between those magnets which are of relevance to the performance of the machine.

The CHAIRMAN. Well now, I think when Dr. Decker testified before the Energy and Water Development Subcommittee the last time, we were talking about phase 1, phase 2 and phase 3. Phase 1 we are engaged in now, which is the R&D phase. Phase 2, as I recall, was you go out with an RFP and make the development phase for the first—I forget what the first buy was, and then phase 3 you went to multiple—the 8,000.

Dr. **SCHWITTERS**. Right.

The **CHAIRMAN**. Now, this looks like five phases—the phase we are in now, then you go out with some kind of RFP for 12, and then you go for 15, and then 100——

Dr. **SCHWITTERS**. No, no, no. I am sorry, let me explain that. The RFP that we are doing now is phase 2 under that language. It is the full development aspect, ultimately 1,000 magnets, but it has different checkpoints in it that you review and look at the program as you go through—the first 12, the first 25, the first 125 and so on. So in that, and the details of that, are precise checkpoints—design reviews, cost reviews and so on. That is phase 2.

The **CHAIRMAN**. All right. That is 1,076 magnets with checkpoints along the way so that in effect you can get out of the deal if they do not pass muster?

Dr. **SCHWITTERS**. That is correct. More important, of course, is to hopefully get a better product at a lower cost.

The **CHAIRMAN**. But that essentially, they would be assured that if they do pass muster they will get the 1,076.

Dr. **SCHWITTERS**. They will get through that, yes, sir.

The **CHAIRMAN**. All right. Now, have you decided on the strategy of whether it is one contractor or two, or multiple?

Dr. **SCHWITTERS**. The strategy here is that we will work principally in the beginning of that with one contractor. Again, it is going to be close teamwork. We do not want to diffuse the development and engineering and scientific effort on that.

It was implicit and built into it a leader-follower concept, for one of the tasks is to be able to bring a second contractor on board at the tail end of that development process to make absolutely sure that we have capability of more than one contractor for the production phase later on.

The **CHAIRMAN**. All right. So that what you foresee is an award under the RFP to one contractor with another looking over his shoulder, participating in what he is doing so that you will be prepared on phase 3, which is the production phase, to make a multiple or dual award if you want to?

Dr. **SCHWITTERS**. Yes, sir.

The **CHAIRMAN**. But that in phase 2, which is 1,076, you foresee a one contractor award only, with the other just observing.

Dr. **SCHWITTERS**. Bringing in a follower, and I think the final buys on that, we can actually—the final buys, as I recall the details, could actually go even more to the follower if the leaders were not producing well, as you got into that.

The **CHAIRMAN**. Okay, and the follower would be participating in hands-on——

Dr. **SCHWITTERS**. Oh, yes. The idea here is we must, again, produce a package that describes the full content of building these magnets.

The **CHAIRMAN**. All right. Now, you are ready to submit that RFP and to make an award this fiscal year?

Dr. **Schwitters**. Yes, sir.

The **Chairman**. You plan to go ahead and do that without respect to what happens with the foreign participation?

Dr. **Schwitters**. I should hand that one to Jim. The DOE has been handling that issue.

Dr. **Decker**. That still is a significant decision for us which we have not made with regard to how we are going to handle this phase two RFP, vis-a-vis foreign participation. That is part of the decision which is holding up the RFP.

The **Chairman**. All right. That is what I thought.

It seems to me we ought to make the RFP for phase two now. We already have this, and there has already been a year's delay, and it seems to me we ought to go ahead and make that RFP now if in fact we do wish to bring in foreign participation on the magnets, which, unless I hear some other arguments, is going to be hard to persuade me to give away what Dr. Bromley talked about as being such important manufacturing technology.

But, certainly in phase two we ought to proceed and learn those techniques, because if we can bring on an alternate second source that is American, surely we can bring on an alternate second source that is foreign. And indeed, foreigners may be involved in the consortium that bids on—in fact they probably will, will they not?

Dr. **Schwitters**. I completely agree with you.

Dr. **Decker**. Yes. This is likely.

The **Chairman**. Well, why then do we not do that? Why do not we go ahead with it?

Dr. **Decker**. Well, I expect that the RFP in fact will be released in the next couple of weeks.

The **Chairman**. The next couple of weeks?

Dr. **Decker**. Yes.

The **Chairman**. And then when would you be prepared to make the award? What is the soonest you could make the award?

Dr. **Decker**. The award, well, that is—I think Roy may be able to tell you that better than I, but hopefully before the end of the summer.

The **Chairman**. Before the end of the summer?

Dr. **Schwitters**. We can make the selection—I think we can still make it even by July or so. Then one has to get into all the contract negotiations and so forth, leading to what I believe would be the sort of early award time, which would be the late summer, August/September timeframe.

Dr. **Decker**. Yes.

The **Chairman**. Well, I do not think you ought to rush to judgment on any scientific endeavor. We know what happens when you do, as with the B-1 bomber. You build it too quickly and before you have all the designs settled.

On the other hand, sometimes you are ready and you delay for political reasons, and it seems to me that this is kind of a political delay and that you ought to go ahead with it without any delay, particularly not one for the foreign contractors. We can always bring them in on phase three.

But phase two, if we can—that is one of the things we will learn in phase two, is whether we can do it ourselves. So I would simply urge that we go ahead.

Dr. Schwitters, do you share Dr. Bromley's high confidence that this design is pretty well fixed in terms of its major requirements and dimensions?

Dr. SCHWITTERS. You are talking now the overall accelerator design?

The CHAIRMAN. Of the magnets.

Dr. SCHWITTERS. Yes, sir, I do. Yes. We have, again, a superb group that have come together. I must say, one of the things that happens here is that the very strong support last year by Congress just helps build the whole momentum here. And so does the accelerator team, as headed up by Helen Edwards, who was the builder of the Tevatron and was awarded last year the National Medal of Engineering for her work. And I have the highest regard and confidence in their work.

The CHAIRMAN. Thank you, Mr. Chairman.

Senator FORD. Thank you, Senator.

Thank you, gentlemen. It gets more interesting as time goes by.

Dr. SWITTERS. Never a dull moment.

Senator FORD. No.

We will have to move on now.

Dr. Sidney Drell, Department of Physics, Columbia University; and Dr. Eugen Merzbacher. We should have the North Carolina and New York Senators here to learn more.

Gentlemen, you know our time is running out, and we are being squeezed just a little bit, I do not want to—I would rather get into questions and answers of some of the problems, and remove some of our cobwebs, but Dr. Drell, if you would proceed, why, we will put your statement in the record, if you

STATEMENT OF DR. SIDNEY D. DRELL, DEPARTMENT OF PHYSICS, COLUMBIA UNIVERSITY

Dr. DRELL. Well, I will be very brief, Mr. Chairman. Thank you, and Senator Johnston, for this opportunity. I will submit a statement for the record and the report of my committee, upon which it is based.

Senator FORD. It will be included in the record as if given, Doctor.

Dr. DRELL. I just want to say very briefly why there is so much excitement in the scientific community in support of this machine and why we think scientifically it is such an important program. The quest to find out what we and our physical world are made of is a mark of civilization that dates back to its very beginning. But it was not until approximately 500 years ago, which is about the time North America was being discovered, that modern science was born.

And this came through the realization that theories must be tested by experiment. And that certain crucial and precise observations can, in turn, lead to new ideas. The strong interaction between theory and experiment permits us to reduce the great diversity that we see in nature around us to a single set of fundamental physical laws. Those laws are the goals of building the SSC. And any progress that can be made on those fundamental laws and their understanding will have its effect everywhere and in everything.

When we learn from pure research based upon experimental observations about the nature of light as an electromagnetic phenomenon, we laid the basis for all modern communications, television, radar, telegraph, generators, et cetera.

When, in this century, we learned about the basic modern quantum theory of the atom and of the relativity theory of Einstein, based again upon experimental observations, we found that pure thought is really useless in the study of nature without the data. It was then that we laid the basis for all the modern scientific developments of this century, lasers, X-ray technology, magnetic resonance imaging that Dr. Bromley mentioned, semiconductors, superconductors, supercomputers, and the like.

Our understanding of nature is all encompassing.

And now, at the end of the 20th century, we are asking what will be the legacy we give to the next generation and the next century? We believe, based upon the progress at Fermi Lab, at SLAC, at CERN, and the theory that goes with that in the last two decades, that there must be an entirely new class of fundamental forces, the ones responsible for symmetry breaking and thereby that give rise to the masses of the observed particles.

And it is of this new force, only whose existence we are aware of and very little else, that we want to use the superconducting supercollidor to study, to permit us to make the next big step. This step will have a profound impact on our understanding of nature. And based upon past experience that were cited very briefly, it is a good bet we can anticipate that it will have a similar long range and vast impact on the technology of the future.

Because the SSC is such a big and expensive program and commands so many dollar resources and human resources of some of the finest brains in this country, it is of course important that we answer questions such as, how important is the SSC in terms of the new knowledge? Are there alternative possibilities, perhaps more modest in size and cost for advancing the frontiers of our knowledge? And how important is it to the United States to invest in science and high energy physics in particular?

Very briefly, as to the importance of the SSC, it has been said many times, and it cannot be repeated too often, the very spirit of physics is to explore the unknown. And while this makes it difficult for us to predict precisely what we will discover in the future, including with the SSC, we are in a position to forecast the minimum payoff I believe.

Based on our present knowledge we are confident that the SSC will explore a specific new energy region in which major new discoveries will be made. This is how the specifications of the SSC were set, and it was holding to this that my subpanel, which has been mentioned here, the DOE panel, was convinced not to shrink the machine.

We are going into an unknown area, but we want to go in there with confidence that we can explore it well enough so that when we come out we can say we have learned the basic idea beyond symmetry breaking. Symmetry is the idea that underlies our understanding of all the forces in nature, of gravity, electromagnetism, weak forces, and the strong nuclear forces.

We have relied on symmetries to unify the weak and the electromagnetic forces, and then we must rely on observations of imperfections in that symmetry to proceed further. And that symmetry breaking, which has been key to the unification leading to the standard model that has been referred to, is what we want to understand. Because therein lies, we believe now, the origins of mass.

Whatever the superconducting supercollidor shows us, if it operates at the energy it has been designed to, we are going to learn fundamental new knowledge. Super symmetry, the Higgs, I do not know what, but there is no way we can end up with the exploration of that energy region and not have added a fundamental new understanding. And that is why we are committed to this machine.

That is why we believe that the CERN collider, which gets us only one-third of the way there, is not a competition. That is like going into a dark wilderness and taking one path through it and coming out the other side. You may have found a gold nugget on the way, you may not have, but you will not have explored the region.

So it is our best scientific judgment, and I must say, when I was asked to chair the panel and went down to Texas to lead that panel, my mind was open on this. I did not go there with a preconditioned idea. I had not been paying close attention to the energy issue. I did my homework. We had this outstanding panel.

And I am now convinced that it is the most sensible way to proceed, to stay with this machine, with this energy, it has no competition in the world for exploring what we think is the crucial area to advance our understanding and to allow us to take another step forward in understanding the evolution of the universe since the Big Bang.

This really is one of the most exciting moments in the history of ideas, at least as seen by a scientist. Because for the first time in this generation we now have an understanding based upon experiment, and not just thought, experiment, of how the universe has evolved since that Big Bang 15 billion years or so ago.

And we think the added understanding of symmetry breaking forces, plus what I hope will come back from that magnificent telescope that I was so excited to see go into orbit this morning before I came over here, that we will add another very important chapter in mankind's understanding of the knowledge of the nature of the world we live in—at least the physical world.

Finally, let me just say how important this is to the United States. When construction of the SSC was recommended by President Reagan in 1988 and reaffirmed last year by President Bush, it was identified as a national goal. And at the same time, a commitment was made to maintain support for a strong and broad-based national program. This is an important commitment, because high quality scientists and engineers are a national resource to the United States.

This technical community is a critical ingredient in our national effort to remain a world leader in technical innovation, to maintain a strong economy and high standard of living, to flourish in competitive high-tech industries, and to meet our goals in national security.

The SSC will be an important component in training students and maintaining a U.S. technological edge for many decades into the next century. It will be a unique tool, ensuring U.S. leadership in helping train outstanding young American scientists at more than 100 American universities in the most sophisticated and demanding new technologies.

It will assure continued U.S. leadership in the field that has been a source of great national pride, as well as a stimulant to important technical innovations. And it will be a boon, and an important challenge to the highest tech leadership of American industries whose experience and expertise will be relied on to build the 54-mile long system of superconducting magnets and to construct the sophisticated detectors that must be designed to select those few events of crucial importance out of a background of hundreds of millions of interactions occurring each second.

This machine will indeed be an important legacy for us to give the next generation of scientists in the 21st century.

[The prepared statement of Dr. Drell follows:]

TESTIMONY ON THE
SUPERCONDUCTING SUPERCOLLIDER (SSC)

before the

SUBCOMMITTEE ON ENERGY RESEARCH AND DEVELOPMENT

of the

SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES

April 24, 1990

———

S. D. Drell

Stanford Linear Accelerator Center

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Thank you for the opportunity to appear before this Subcommittee to testify on the importance of the Superconducting Super Collider (SSC). The following written statement was prepared in collaboration with Professor T. D. Lee of Columbia University for our appearance on this subject before the Subcommittee on Energy and Water Development of the House Appropriations Committee on March 22, 1990. I wish to submit it for the proceedings of these hearings.

The quest to find out what we and our physical world are made of is a mark of civilization that dates back to its very beginning. But it wasn't until approximately 500 years ago--about the time of the discovery of North America--that modern science was born. This came about through the realization that theories must be tested by experiment, and that certain crucial and precise observations can in turn lead to new ideas. Through this strong coupling between experiment and theory, we are able to reduce the great diversity of natural phenomena to a single set of fundamental physical laws. Therefore, any progress that can be made on the fundamental laws will have its effect everywhere and in everything.

The important observations on electricity by Ben Franklin in the 18th century and the crucial experiments on the electric and magnetic forces by Faraday in the 19th led to the unification of these two forces by Maxwell later in that century. This, in turn, made it possible for us to understand the fundamental nature of light and its identity as a pure electromagnetic phenomenon. From this breakthrough came the development of generators, electric motors, telegraph, television radar and, indeed, all modern communications.

At the turn of our century two crucial, though seemingly esoteric, discoveries were made. One was the experiment by Michelson and Morley in 1887 in this country; the other was the black-body radiation formula by Max Planck in 1900. The former was the basis for Einstein's theory of relativity and the latter laid the foundation for us to construct quantum mechanics. In this century, all the modern scientific and technological developments--nuclear energy, atomic physics, molecular beams, lasers, x-ray technology, semiconductors, superconductors, supercomputers--only exist because we have relativity and quantum mechanics. To humanity and to our understanding of nature, these are all encompassing.

Now, near the end of the twentieth century, we must ask what will be the legacy we give to the next generation in the next century? The physicists at the end of the 1890's had a glimpse of a new vista, the existence of exciting and unexplored fundamental areas. Today we also know of the existence of an entirely new class of fundamental forces: the one that is responsible for symmetry breaking. Of this new force, we know only of its existence, and very little else. The new Superconducting Super-collider (SSC) is the key we will use to unlock the door and to take the next big step. As was the case when other great advances were achieved in understanding nature, present progress on the basic physical laws will have a similar long-range and vast impact on the technology of the future.

Since the SSC project is of so large a magnitude and so great an expense, it naturally invites a number of serious questions, such as:

1) How important is the SSC in terms of the new knowledge it will provide?

2) Are there alternative possibilities, perhaps more modest in size and cost, for advancing the frontiers of our knowledge?

3) How important is it to the United States to invest in science, and in high energy physics in particular? What practical benefits to society can be expected to result from the SSC?

1) How important is the SSC in terms of the new knowledge it will provide?

The very spirit of physics is to explore the unknown. While this makes it difficult for us to predict precisely what we will discover in the future, we *are* in a position to forecast the minimum payoff. Based on our present knowledge, we are confident that the SSC will explore a specific region in which major new discoveries will be made. The SSC specifications were established with this goal in mind, and experience gained since 1983 has strengthened our conviction of the importance of constructing a proton-proton collider with the beam energy of 20 TeV and luminosity of 10^{33} cm^{-2} sec^{-1}, as originally proposed.

As a result of truly remarkable progress during the past twenty years, we do have one clear benchmark that is crucial as a guide in setting the energy of SSC at 20 TeV. This benchmark comes from our success in unifying the electromagnetic forces with the weak forces of radioactive decay into a single entity, the electroweak interaction (commonly referred to as the standard model); it is an achievement reminiscent of the unification of electricity and magnetism by Maxwell, referred to earlier.

Based on our new theoretical structure for unifying weak and electromagnetic forces, the existence and masses of new particles, the W and Z intermediate bosons, were predicted and confirmed experimentally at CERN in Europe in 1983. From the predictions of this theory, we are certain that exciting new phenomena must appear at the SSC design energy.

At present, we know that there exist three classes of forces, the strong force that binds the nucleus together, the electroweak force, and gravity. We know that all these forces are based on symmetry principles, yet practically all these symmetries are broken. The symmetry breaking lies outside the present scope of our understanding. A major task of the SSC is to understand this new class of symmetry-breaking forces. Our present electroweak theory makes it possible for us to say with confidence that 20 TeV is about the minimum energy needed to see the new phenomena in whatever form they may take.

The masses of all known particles break these symmetries. Consequently, an understanding of the symmetry-breaking forces will lead to a comprehension of the origin of the masses of all known particles. One of the promising manifestations of symmetry breaking may be the existence of a new type of particles, the Higgs mesons. If so, then in addition we would also discover such new particles. In order to make sure that we can unravel the nature of the symmetry-breaking force in the electroweak interaction, we must measure the scattering between the W and Z bosons, and that we are confident can be done at the 20 TeV design energy of SSC.

The recent major advances in particle physics and astrophysics have given us the first-ever experimentally-based glimpse of the history of how the universe has evolved following the Big Bang of some 15 billion years ago. The very high collision energy of the SSC will recreate the physical state that existed in our universe about 1 femtosecond (10^{-15} sec.) after the Big Bang. Future history books will tell that ours was a time when mankind was able to begin recreating the evolution of the universe following that Big Bang based on solid experimental data, not just on theoretical concepts. The SSC together with our scientifically productive deep space probes will enable us to write further chapters in that history.

The search for the smallest building block that everything is made of drives us to explore physical phenomena within smaller and smaller distances; that necessitates energies higher and higher in inverse proportion to the distance in question. The SSC energy will enable us to examine the physical space within an atto-centimeter (i.e., 10^{-18} cm., a distance hundreds of thousands times smaller than the size of a nucleus). Since there is no comparable facility being planned anywhere else in the world, the very uniqueness of SSC insures that we will be exploring in an entirely uncharted region. Of course, we cannot predict what kind of new basic particles SSC will definitely produce. It is precisely this major step into the unknown that poses the challenge, captures our imaginations and promises the greatest intellectual rewards. This is why SSC will attract the best creative young minds in the world. It will also restore our cutting edge in both basic science and high technology.

Physics is monolithic. There exists only one universe, our universe. The multitude of forms of all matter obeys only one set of fundamental laws and we are at the threshold of comprehending that set of fundamental laws. To nature, the same set of laws governs the motion of all particles in every aspect of their manifestations--gas, liquid, solid, living beings, planets, stars, galaxies, from the beginning of the universe to the present. In physics, there is no distinction between the different disciplines of our profession. Our aim is to understand that set of laws which governs everything. SSC makes a direct route toward achieving this understanding. It will be our contribution to the civilization of the next century.

2) Are there alternative possibilities, perhaps more modest in size and cost, for advancing the frontiers of our knowledge?

This question has been addressed by the community of high energy physicists--the machine builders, the experimentalists and the theorists--since 1982 in a number of workshops and in collaboration with the Department of Energy through the mechanism of its HEPAP, the High Energy Physics Advisory Panel. Encouraged by the dramatic discoveries at the CERN proton-antiproton collider and by the successful operation of the Fermilab Tevatron--the first superconducting synchrotron--the 1983 HEPAP Subpanel on Future Facilities recommended "the immediate initiation of a multi-TeV, high-luminosity proton-proton collider project with the goal of physics at the earliest possible date." That recommendation may be taken as the beginning of the SSC project.

In March 1986, the SSC Central Design Group, composed of physicists and engineers drawn from universities and national laboratories around the world, produced a site-independent conceptual design for a proton-proton collider with 20 TeV per beam and peak luminosity of 10^{33} cm^{-2} sec^{-1}. The two most important ingredients of that recommendation were the conviction of the scientific community that the technology existed to build a reliable and versatile SSC project designed to those specifications and that our scientific understanding provided confidence that the SSC would provide the data necessary for the beginning of an exploration of how symmetries are broken in the basic forces of nature, leading to an understanding of the origin of the masses of all particles.

The SSC Laboratory (SSCL) management has now developed a detailed design, specific to the site selected in Ellis County, Texas by the DOE. This has led to an increase in the estimated total project cost from the 1986 proposal. The cost increase arises primarily from two types of changes. The first type involves recalculation of labor and materials costs and requirements for magnet R&D and instrumentation to assure reliable accelerator performance. The second type involves technical changes (higher injection energy and a larger magnet aperture).

The main reason for the technical change is because large-scale accelerators using superconducting magnets have only been in operation since 1986, after the original conceptual design of the SSC was made. Over the last two years, beam measurements at the Tevatron at Fermilab and magnetic measurements at DESY (the German Electron Synchrotron Laboratory) have shown the existence of persistent eddy currents that require correction. Based on this experience, the injection energy and the magnetic aperture were increased in order to ensure a reliable machine. New massive numerical simulations using supercomputers now provide us with detailed knowledge of stability under realistic operating conditions. SSCL judges these technical changes to be required for reliable operation and efficient commissioning of the new accelerator.

As a result of these changes, and in particular the increased cost, the DOE constituted a "HEPAP Subpanel on SSC Physics" "to provide advice on the range of useful machine parameters in order to complete the design phase of the facility."* It was the unanimous recommendation of this panel, and HEPAP itself in accepting and transmitting it to DOE, that implementing these design changes "will ensure confidence in reliable and timely operation of the SSC." The subpanel found that the only cuts that would allow substantial cost savings would seriously reduce the capabilities as well as he scientific potential of the SSC. It recommended unanimously against redesigning the machine with a reduced circumference, and a proportionally reduced energy. The scientific basis for this recommendation was summarized succinctly in the transmittal letter of HEPAP Chairman Professor Francis Low to Dr. James Decker, Acting Director of the Office of Energy Research:

> "The Subpanel has concluded on physics research grounds that any substantial reduction in the energy of the SSC would compromise our ability to elucidate the nature

> of electroweak symmetry, a truly fundamental problem at the core of the Standard Model. This is because, with 20 TeV beams, there is a confidence that these phenomena can be studied in whichever form they take, whereas, this confidence is quickly lost at lower energies. In addition, no substantial increase of luminosity can make up for a reduction in energy because no multipurpose detector is capable of operating well above 10^{33} cm^{-2} sec^{-1}, the design luminosity of the SSC. Only limited purpose, specially designed detectors can operate at higher luminosities, and these are not capable of thorough exploration of the phenomena in question."

In essence the scientific judgment is that such a reduction would unacceptably increase the risk of missing important new physics which is the very goal of building SSC.

Finally we comment that SSC will be a unique facility well into the next century. It will represent a great step by a factor of ten or more beyond any other accelerator now operating or under construction. CERN in Geneva is seriously considering constructing a proton-proton collider in the existing 17-mile-circumference tunnel for its currently operating Large Electron-Positron (LEP) accelerator. However, the SSC with its 54-mile tunnel and 20 TeV beam energy compared with the 8 TeV design maximum at the CERN design concept, will have the unique potential to explore a wide range of physics in the energy range we believe crucial for our discovering the exciting new phenomena for understanding symmetry breaking and particle masses that are the primary goal of SSC physics.

3) How important is it for the United States to invest in science, and in high energy physics in particular? What practical benefits to society can be expected to result from the SSC?

When construction of the SSC was recommended by President Reagan in 1988, and reaffirmed by President Bush in 1989, it was identified as a national goal. At the same time a commitment was made to maintain support for a strong and broad-based national program. This is an important commitment because high quality scientists and engineers are a national resource of the United States. This technical community is a critical ingredient in our national effort to remain a world leader in technical innovation, to maintain a strong economy and high standard of living, to flourish in competitive high-tech industries, and to meet our goals in national security.

The SSC will be an important component in training and maintaining a U.S. technological edge. For many decades into the next century it will be a unique tool ensuring U.S. leadership and helping train outstanding young American scientists and engineers, and students from more than one hundred American universities in the most sophisticated and demanding new technologies.

More than 50 years ago Ernest Lawrence at Berkeley and Merle Tuve here in Washington built the first large accelerators in the United States in order to study the structure of subnuclear matter. From that day to the present the excitement, the romance of probing nature's secrets with the most fundamental of all questions: "What are we made of?" has attracted the best scientific talent of this country.

SSC will assure continued U.S. leadership in this field that has been a source of great pride as well as a stimulant to important technical innovations in superconducting technologies and computer control of complicated systems. It will also be a boon and an important challenge to the highest-tech leadership of American industries whose experience and expertise will be relied on to build the 54-mile-long system of superconducting magnets and to construct the sophisticated detectors that must be designed to select those few events of crucial importance out of a background of hundreds of millions of interactions occurring each second.

Conclusion

To summarize, the physics community--American and world-wide--is excited by the prospect that the SSC will begin to provide data by the end of this decade. Through research, training and industrial manufacturing the SSC project will contribute to American technological strength. It will also be a magnet for scientific cooperation world-wide. It will advance our undertanding of the universe and it will help define the quality of our culture. It will indeed be an important legacy for us to give to the next generation of scientists of the 21st century.

Senator FORD. Thank you very much, Dr. Drell.
Dr. Merzbacher.

STATEMENT OF DR. EUGEN MERZBACHER, PRESIDENT, THE AMERICAN PHYSICAL SOCIETY

Dr. MERZBACHER. I appreciate the opportunity to speak here on behalf of the American Physical Society. I am this year the President. We have 40,000 members in academic institutions, government laboratories and industry. The American Physical Society had two major interrelated concerns that impact on the research budget of the Department of Energy, which as you of course know and have heard repeatedly today, includes a great deal more than money for the SSC.

First, that in planning for the support of basic scientific research, full attention be given to the important role which research, particularly at universities, plays in assuring that there will be a future generation of creative and productive scientists in this country, and in providing a knowledge base for future exploitation by society.

And second, that a balanced menu of basic research in physics and other sciences be maintained and new scientific opportunities and challenges pursued whenever they arise in the many small groups of individual investigators, or in large collaborative facilities, such as the SSC or CEBAF.

We appreciate the enlightened attitude that has guided the Department of Energy in the past. They always have had a broad view of energy research, and the department has, in the process, gained valuable experience, especially in overseeing the construction of very large scientific facilities.

It is our strong recommendation that as it moves forward towards making the SSC a reality, the Department of Energy be given the means to continue to discharge, as the highest priority, its broader responsibilities towards basic scientific research in physics and other sciences.

The administration's 1990/1991 budget is responsive to these aims and we support it.

Now, as you have also been told already, nothing can be done in science without people. And it might be helpful for prospective—for you to take a look at a graph that is here at the end, next to the last page, that shows you the distribution of physicists, roughly, very approximately, in our profession. These are the members in our various divisions.

And you will see that the membership includes over 6,000 physicists in the division of condensed matter physics. That is, roughly speaking, solid state physics.

There over 3,000 physicists who identify with the division of particles and fields, and that is high energy physics. And these are the people that are in particular concerned very directly with the SSC. It is also this division that provided the initial impetus for the proposal to build the SSC.

But, in addition, if you look, there are 10,000 physicists who belong to medium-sized divisions dealing with chemical physics, plasma physics, atomic, molecular and optical physics, and nuclear physics.

And yet another 10,000 in a dozen smaller and more specialized subfields, from astrophysics to the study of fundamental physical constants and precision measurements.

So what I am trying to say is that physics is not just a nickname for high energy physics.

In the past 25 years the number of physicists has doubled. And the trend has been the same in the other sciences. Without this growth we would not have stayed at the forefront of science and technology.

However, the resources for research have not increased sufficiently for us to derive the full benefit of this highly skilled scientific labor force, nor to assure our future scientific leadership. It has already been noted that the entire electronics and computer industries are derived from what seemed to be arcane research in solid state physics and chemistry some 30 or 40 years ago.

The need for an adequate pool of young scientists at many points in our technological society is obvious. The problems of energy and environment which are particularly germane to the mission of DOE call for involving the best and the brightest among our population. And I am glad to note that the Secretary of Energy appreciates this linkage and has taken the initiative in science and mathematics education.

Now, advanced science education and basic research are not separable. Dr. Schwitters emphasized this also. The American system of higher education owes its enormous success to the blending of teaching with research at the graduate level, and increasing also at the undergraduate level.

A large fraction of research in physics and other sciences is done by students and post-doctoral fellows, and these are people who in many cases receive support directly or indirectly from the Department of Energy or the National Science Foundation, or other agencies.

This research experience trains them for industry, government and the academic world. The strength of our graduate educational programs in physics accounts in large measure for the attractions that our universities exert on students from many parts of the world. And we have talked about getting equipment and money from foreign countries. We are also getting a lot of people.

I might just mention that the class I am just missing right now has 13 graduate students in it. Of these, six are Chinese. And we are lucky to have them flock here for advance training. We stand to lose our lead in science, however, if we fail to provide for our young people opportunities in research across all active disciplines which meet the criterion of high scientific quality and national need.

Research programs in the universities under the guidance of individual experienced scientists, working with small groups of students, are the mainstay of this system for educating the next generation. The education of young scientists, by doing frontier research in universities, is threatened by fiscal starvation in many important subfields of the sciences.

And yet, you can never predict where something important will emerge. The 1989 Nobel Prizes in physics were awarded to one German and two American university physicists for magnificent important advances in high precision measurements or atomic and subatomic physical quantities.

This research has led to some remarkable technical applications in defense and civilian systems, such as very fine clocks. These are useful for navigational pinpointing and long baseline interferometry have been used in the Voyager mission.

Almost 100 young Ph.D. physicists were trained over the years by these two American research groups in universities. Quite understandably, we saw this morning, of course, most discussions about the Nation's science budget, and especially about the DOE budget, focused on the SSC. It is a grand project of very large dimensions in every respect, and I agree with everything that my colleague, Dr. Drell, here said about it.

And it necessarily sets the scale by which other science projects are measured. It is a big step into the unknown. It promises to extend our understanding of the structure of matter and the origin of the universe.

Authorization of the SSC and construction at an expeditious rate will send a signal to the world that the United States is determined to continue its leadership role in scientific research. But it must not be allowed to jeopardize support for individual investigators at universities in many other important fields of physics and other sciences.

The issue of balanced support for research in physics has always been an important matter to the physics community. The members of the American Physical Society are strongly committed to the notion that basic research in all the productive subfields of physics should be maintained at a level that is commensurate with the future economic well-being of the Nation.

It would be a serious mistake to let our preoccupation with one or a few large facilities to overshadow the bulk of successful physics research. We must move forward at the frontier of science in all promising directions. And we are pleased that the President's proposed budget recognizes this imperative.

It is crucial to appreciate that much of our economic vitality today is the result of investment in basic research in past decades. If we fail to sustain basic research today we cannot hope to maintain our national vitality in the decades to come.

Now it is a fact that while total civilian and defense R&D obligations by the Federal Government have actually risen over the years in many categories, our basic research capabilities have actually sagged to a lower level in many areas, and this must concern all of us. The plight of the scientific infrastructure that you have heard about in the universities, and the loss of momentum in the material science programs in national laboratories are just two well-established examples of this pervasive problem. And I remind you of the Bromley-Packard report of 1986, about the infrastructure and the need to shore it up.

It should not be surprising that the cost of doing good basic research has escalated. Laser technologies, superconducting technologies, microelectronic technologies, and many other advances feed back into the scientific research system that created them and make it more sophisticated, as well as more expensive.

The SSC would be quite unimaginable without all of these technologies. It may, in turn, produce some useful technological spinoffs, although this potential, at times, has been overstated and should not be used as a justification for the SSC. It should be built only on its fundamental scientific merit, as a tool for exploring the world of subatomic particles.

In this regard, it resembles the Hubble Space Telescope, I quite agree, that carries with it our hopes for a deeper understanding of the structure of the universe. And I am delighted to hear—I was on the plane when it went up—I am delighted to hear that it did.

Those who are responsible not only for balancing the budget, but also for balancing research needs might be tempted to think of reaching both goals by either stretching out the construction of the SSC in time, and perhaps other large facilities, while maintaining the support of less conspicuous research programs at an acceptable level.

Or, conversely, by keeping the SSC on a timely schedule, but deferring other important projects for a few years. In our view, both of these approaches are flawed, since they ignore fundamental realities.

Basic research programs are not amendable to a spigot technique that allows one to turn the flow of interesting and useful results on and off at will. We must find a better way to reconcile the finiteness of the country's resources, and we very much recognize this for basic research with the need to remain the world leader in science and technology.

In conclusion, the American Physical Society urges that the science budget be regarded as a necessary investment to keep us in a leadership position over the long haul into the next century.

Thank you very much, Mr. Chairman.

I am ready to answer questions.

[The prepared statement of Dr. Merzbacher follows:]

Testimony of Dr. Eugen Merzbacher
Senate Committee on Energy and Natural Resources
Subcommittee on Energy Research and Development
April 24, 1990

Mr. Chairman and Members of the Committee:

Good morning. My name is Eugen Merzbacher. This year I serve as President of the American Physical Society, which has over 40,000 members in academic institutions, government laboratories and industry. I am also the interim Chairman of the Physics Planning Committee (PPC) of the APS.

The Physics Planning Committee was formed by the APS Council a year ago "to create a forum within the physics community for broadly assessing . . . future directions of physics" and "to develop a balanced plan for physics in the context of the nation's scientific and technological needs." The PPC has three vice-chairmen, William F. Brinkman, Leon M. Lederman, and Andrew Sessler, whose own research interests span a broad range of the many different subfields in which physicicists contribute to the progress of science (see Appendix).

The American Physical Society is dedicated to the advancement and diffusion of the knowledge of physics. It has two major interrelated concerns that impact on the research budget of the Department of Energy:

1. That, in planning for the support of basic scientific research, full attention be given to the indispensable role which research, particularly at universities, plays in assuring that there will be a future generation of creative and productive scientists, and in providing a knowledge base for future exploitation by society;
2. That a balanced menu of basic research in physics be maintained and new scientific opportunities and challenges pursued, wherever they arise, in the many small groups of individual investigators or in large collaborative facilities.

We appreciate the enlightened attitude that has guided the Department of Energy in the past. It inherited from the Atomic Energy Commission, and later from ERDA, a broad view of energy research, and it has in the process gained valuable experience, especially in overseeing the construction and nurturing of very large scientific facilities.

It is our strong recommendation that, as it moves forward towards making the SSC a reality, the Department of Energy be given the means to continue to discharge as the highest priority its broader responsibilities towards basic scientific research in physics and other sciences. The Administration's 1991 budget is responsive to these aims, and we support it.

Nothing is accomplished in the conduct of scientific research without a steady flow of talented and well-educated people, essential as bricks, mortar, and equipment are. A profile of the APS membership may be helpful in this regard (See figure). The membership in the various research subunits of physics includes over 6,000 physicists in the Division of Condensed Matter Physics, which includes solid state physics. Almost 3,500 physicists identify with the Division of Particles and Fields, which in essence is high-energy physics; this Division provided the initial impetus for the proposal to build an SSC, which will serve the high-energy physics community. But in addition, there are 10,000 physicists who belong to medium-size Divisions dealing with Chemical Physics, Plasma Physics, Atomic, Molecular and Optical Physics, and Nuclear Physics, and yet another 10,000 in a dozen smaller and more specialized subfields, from astrophysics to the study of fundamental physical constants and precision measurements.

In the past twenty-five years the number of physicists has doubled, and the trend has been the same in other sciences. Without this growth we would not have stayed at the forefront of science and technology. However, the resources for research have not increased sufficiently for us to derive the full benefit of this highly skilled scientific labor force, nor to assure our future scientific leadership. Without going into detail, we note that the entire electronics and computer industries are derived from what seemed to be arcane research in solid state physics and chemistry some thirty years ago.

The need for an adequate pool of young scientists at many points in our technological society is obvious. The problems of energy and environment, which are particularly germane to the mission of DoE, call for involving the best and the brightest among our population. Fortunately, the Secretary of Energy appreciates this linkage and has taken the initiative in science and mathematics education; I hope that the Congress will strongly support him in this endeavor.

Advanced science education and basic research are not separable. The American system of higher education owes its enormous success to the seamless blending of teaching with research at the graduate level, and increasingly also at the undergraduate level in colleges and universities. A large fraction of research in physics and other science is done by students and postdoctoral fellows. This research experience trains them for industry, government, and academe. The strength of our graduate educational programs in physics accounts in large measure for the attractions that our universities exert on students from many parts of the world. We are lucky to have them flock here for advanced training.

We stand to lose our lead in science if we fail to provide for our young people opportunities in research across all active disciplines which meet the criterion of high scientific quality and national need.

Research programs in the universities under the guidance of individual experienced scientists working with small groups of students are the mainstay of this system for educating the next generation. The education of young scientists by doing frontier research in universities is now threatened by starvation in many important subfields of physics and other sciences.

Yet, no one can predict which branch of this tree will bear the next fruit. The 1989 Nobel Prize in Physics, for example, was awarded to two American university physicists for magnificent and enormously important advances in high precision measurements of atomic and subatomic physical quantities. This research has led to some remarkable technical applications in defense and civilian systems, such as clocks of unsurpassed precision. These are useful for high-resolution navigational pinpointing and long-baseline interferometry, and have been used in the Voyager mission. Almost one hundred PhD physicists have been trained over the years in these two research groups.

Quite understandably, most discussion about the nation's science budget, and especially about the DoE budget, focus on the SSC. It is a grand project of very large dimensions in every respect, and it necessarily sets the scale by which other science projects are measured. It is a big step into the unknown, and it promises to extend our understanding of the structure of matter and the origin of the universe significantly. Authorization of the SSC, and construction at an expeditious rate, will send a signal to the world that the United States is determined to continue its leadership role in scientific research. But it must not be allowed to jeopardize support for individual investigators at universities in many other important fields of physics.

The issue of balanced support for research in physics has always been an important matter to the physics community. The members of the American Physical Society, about 50% of whom are in the academic sector and 50% in government and industrial laboratories, are strongly committed to the proposition that basic research in all the productive subfields of physics be maintained at a level that is commensurate with demonstrated need. It would be a serious mistake to let our preoccupation with one or a few large facilities overshadow the bulk of successful physics research. We must move forward at the frontier of science in all promising directions, and we are pleased that the President's proposed budget for 1991 recognizes this imperative.

We are well aware of the severe limitations arising from the need to put the country's budgetary house in order. Indeed, physicists, especially at the universities, have labored under these limitations for some time, and physics in the United States has during the past few years steadily lost ground by comparison with our more aggressive scientific colleagues and competitors in Europe and in Japan. It is no longer feasible to aspire to be Number One in every area of physics or indeed of any science. Nor is there, in the international cooperative enterprise that characterizes science, a need to excel in everything. But, it would be irresponsible for us not to build on our existing strength, or to fail to support basic research in areas that are demonstrably central to the scientific and technological culture in which we all have chosen to live. It is crucial to appreciate that much of our economic vitality today is the result of investment in basic research in the past decades. If we fail to sustain basic research today, we cannot hope to maintain our national vitality in the decades to come.

It is a fact that while total civilian and defense R & D obligations by the federal government have risen over the years in many categories, our basic research capabilities have actually sagged to a lower level in many areas, and this must concern all of us. The plight of the scientific infrastructure in the universities and the loss of momentum in the materials science programs in national laboratories are just two well-established illustrations of this pervasive problem.

It should not be surprising that the cost of doing good basic research has escalated. Laser technologies, superconducting technologies, microelectronic technologies and many other advances, feed back into the scientific research system that created them and make it more sophisticated as well as more expensive.

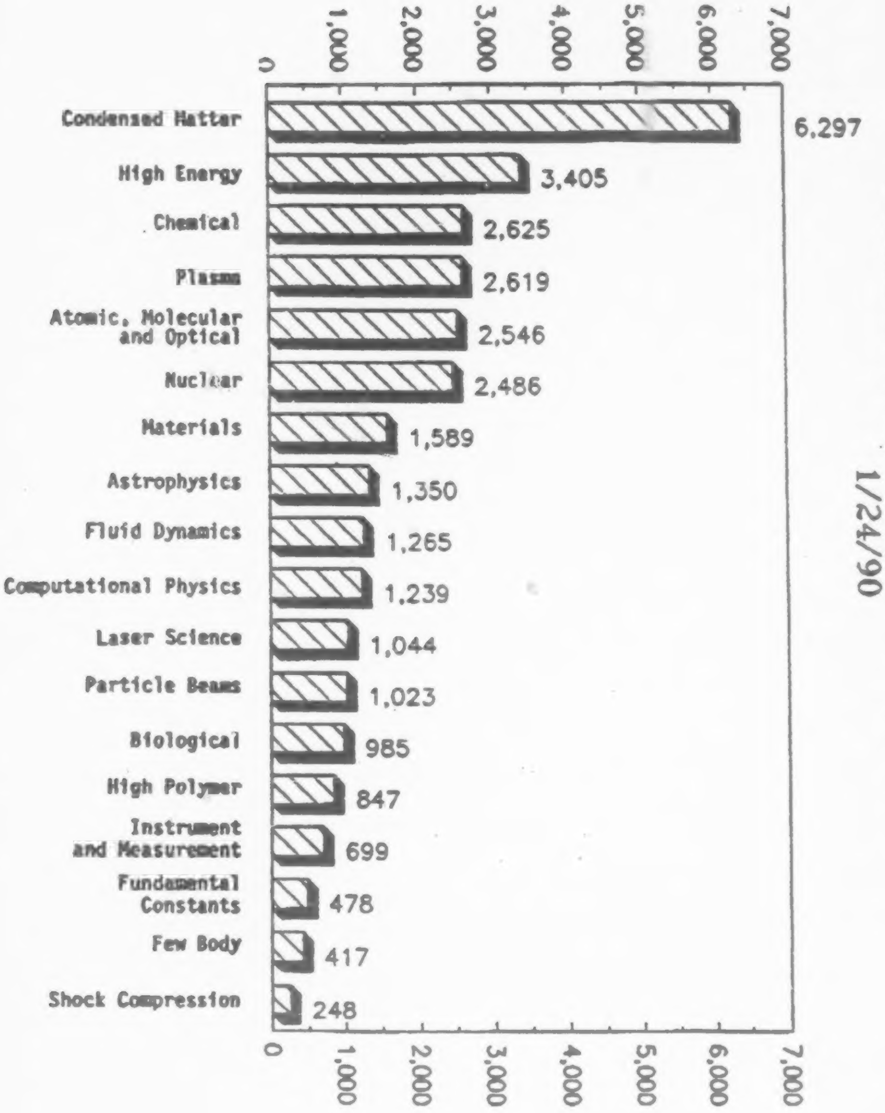
The SSC would be unimaginable without all of these technologies. It may in turn produce some useful technological spin-offs, although this potential at times has been overstated and should not be used as a justification for the SSC. It should be built only if we can convince ourselves and our representatives of its fundamental scientific merit as a tool for exploring the world of subatomic particles. In this regard, it resembles the Hubble Space Telescope that carries with it our hopes for a deeper understanding of the structure of the universe.

Those who are responsible not only for balancing the budget but also for balancing research needs might be tempted to think of reaching both goals by either stretching out the construction of the SSC and perhaps other large facilities, while maintaining the support of less conspicuous research programs at an acceptable level, or conversely, by keeping the SSC on a timely schedule but deferring other important projects for a few years. In our view, both of these approaches are flawed, since they ignore fundamental realities. Basic research programs are not amenable to a "spigot" technique that allows one to turn the flow of interesting and useful results on and off at will. We must find a better way to reconcile the finiteness of the country's resources for basic research with the need to remain the world leader in science and technology.

The American Physical Society urges that the science budget be regarded as a necessary investment to keep us in a leadership position over the long haul into the next century.

I thank you for your attention, and I shall be glad to answer questions.

AMERICAN PHYSICAL SOCIETY



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Appendix

Eugen Merzbacher is Kenan Professor of Physics at the University of North Carolina at Chapel Hill. His research area is quantum mechanics and its applications to atoms and nuclei, and university-level physics education. He is also a Principal Investigator on a Department of Energy grant in support of basic physics research at the Triangle Universities Nuclear Laboratory (TUNL) facility at Duke University, the University of North Carolina at Chapel Hill, and North Carolina State University.

William F. Brinkman, a condensed-matter physicist and Executive Director of Physics Research at AT&T Bell Laboratories and former chairman of the Physics Survey Committee which produced the 1986 report, PHYSICS THROUGH THE 1990s, under the auspices of the National Research Council. He also served on the recent DoE High Energy Advisory Panel subgroup, chaired by Sidney S. Drell, which evaluated the redesigning requirements of the SSC.

Leon Lederman, an experimental high-energy physicist, Nobel Laureate, Professor at the University of Chicago, former Director of Fermilab and President-elect of the American Association for the Advancement of Science; and

Andrew Sessler, an expert on the physics of particle beams, staff member at the Lawrence Berkeley Laboratory and formerly its Director.

Senator **Ford**. Thank you very much, Dr. Merzbacher. Let me ask both of you this question. And I think, Dr. Merzbacher, you made the statement. But are both of you concerned that the SSC may end up taking resources away from other research areas that are supported and are maintained by DOE? Dr. Drell.

Dr. **Drell**. I would be concerned if that were the case. In my remarks I emphasized that, I view the SSC as a declared national goal that is to be built because of its scientific merit and as part of this nation's policy of investing in the scientific frontier. If the price of building the SSC, as much as I want it, is to harm the base of science in this country—all of physics, chemistry and biology, or in fact, other immediate needs of this country—then, all I can say is, sir, I do not want it.

I think it is an extremely important machine for us to build, and we look to our Congress, our Representatives or Senators for the leadership to set a balance of funding that is an investment in the future, a legacy for the next generation and for maintaining a strong, scientific community across the board in this country and for meeting our other needs. But if I were forced to say, would I rob Peter to pay Paul, I would have to say, I do not want this machine.

Senator **Ford**. Yes, but Paul would always be for Peter too, is he not?

Dr. **Drell**. I mean, your problem is much harder than the problem of the physicist who tells you, why I need this machine. We look to you for the leadership which says, where do you find the resources of investing in the greatness of this country and our civilization for the future.

Dr. **Merzbacher**. I agree with Sid Drell certainly. My concern is sort of a practical one that no matter what we pronounce piously in the spring now that, if it happens that funds really are very limited that we be sure that we maintain this healthy attitude in the fall also.

Senator **Ford**. I understand that language very well.

I asked the others, at what point in cost would you recommend that we stop or halt or whatever? And your point is, when it starts deluding other areas of research.

Dr. Schwitters said limit only by—only by the amount of young that are encouraged and enthused. And he did not put this question as it relates to dollars. He gave his answers on the basis that students, graduates, those who are enthused and interested, and as long as you have that, this project can move forward. But no amount of money will take care of the other part.

Dr. **Drell**. Can I make just one comment, which I did not hear said explicitly in this morning's testimony. I have been in the field of high energy physics for a long time. I chaired the High Energy Physics Advisory Panel for the Department of Energy, the AEC before that for eight years. And so, these questions of cost and cost escalations have been before us for many years.

I have never seen a machine more thoroughly reviewed in terms of its cost and understanding as this one has now. And that was a factor in my panel's considerations. I think that given now the experience gained from the Tevatron operation and the HERA operation in Germany about superconducting magnets and the residual fields at low field strengths, we have a very solid technical base for confidence that there are no big ghosts or skeletons in the closet.

There will, of course, be some cost inevitably having to do with labor market and practical things which will cost small parts. And I think Dr. Schwitters was quite accurate in the presentation. But I have a level of confidence in this machine that is unusually high, in the sense that it has been thoroughly scrubbed. And the most recent review, which has built in a good margin of conservatism by enlarging the aperture and increasing the injector energy.

Senator **Ford**. I might say, Doctor, that I am beginning to agree with your analysis a little. But this year, it is $318 million.

Dr. **Drell**. Yes.

Senator **Ford**. At this cost, SSC will need $900 million annually when we get to the full construction.

Dr. **Drell**. Yes.

Senator **Ford**. Now, it will increase the budget. We only have two sides to work here, increase the budget, or we will take it from other physics.

Dr. **Drell**. I think you will find that at that stage when we are really rolling ahead and one sees the light at the end of the tunnel, you will find that more and more of the high energy physics community and accelerator community will be engaged in the work of that machine and in preparing to utilize it.

You do not just go in and use the machine when it turns on, as we learned at SLAC very well. It takes years of investment, intellectual investment of learning how to be creative working with these awesome instruments that are going to be the detectors of this machine. And I think you will find that there will be part of that $900 million coming out of what is now the base program at the other labs in a natural way.

Senator **Ford**. All those other high energy people will not want to give up on their projects either, and that is somewhere around $600 million a year now. So, it continues. There is no lottery here.

Dr. **Drell**. No, no. I believe——

Senator **Ford**. If there is a lottery, we want to be the winners, so we can fund it.

Dr. **Drell**. No, I understand that. And no one wants to give up. But I think we—you have every right to expect us to behave better than this to say that, you cannot close our arsenal or our military base or something. No, I think, there will be an evolution in there in a natural way.

Senator **Ford**. There is probably more people at the base closing to vote than there would be your people.

Dr. **Drell**. That is true. That is true.

Senator **Ford**. Senator Johnston.

The **Chairman**. Dr. Merzbacher, I strongly agree with you—what you say about science. I think we need more money in science in general in this country. But I also agree with Senator Ford, we need to prioritize things.

Now, I asked earlier to the science advisor about the—or Senator Bumpers asked about the space station, and he said, it was not appropriate for him to say how important that was. Would you care to give us your view?

Dr. **Merzbacher**. Well, I am not really terribly well informed on the space station. I have had some—I have wondered about it, and I have talked to my colleagues in physics and also in astronomy. And I am not fully convinced that that proposed way is really the most effective way of reaching the goals that are set out for it.

The **Chairman**. Well, actually, as I understand it——

Dr. **Merzbacher**. You know, I think that unmanned space exploration is certainly extremely important.

The **Chairman**. Well, do not most of your colleagues say that unmanned is superior to the manned space station?

Dr. **Merzbacher**. I think many of them do say that, yes.

The **Chairman**. What do you say——

Dr. **Drell**. Well, I have to agree with that. And I think, as I see it, the unanimity with which not only the high energy physics community, but I believe the entire scientific community backs the SSC, if one understands that the money for it is not being taken away from them. But, I mean, it is being built as a national goal in addition to a sound program.

That unanimity does not exist for the space station, and I think for good reason. Because there are many scientists who feel that the basic science that one wants to learn may be better learned without the interference of the human disturbance of the medium and of the environment and the added cost.

The **Chairman**. The space telescope, the Hubble space telescope is a much more broadly supported, is it not?

Dr. **Drell**. I can wax lyric about that to the same extent you have heard me wax lyric about the SSC. I think today—hopefully it gets into an operating orbit and operates. We still have some—our fingers crossed on that. But I think it is just a fantastic moment in history that we can do that.

The **Chairman**. I agree. You have heard us talk about this magnet technology. Do you have any view, either one of you, about whether we should do that at home, or whether we ought export that. Is that a matter as to which you have a few comments?

Dr. **Drell**. It is not an area of my expertise, especially, Senator. But to me, it seems to me the operative point is that, we have our industry engaged in all the important aspects of developing the production and the quality control and whatnot that, we become comfortable with all those technologies. And, in fact, to the extent that we are developing new standards. We are advancing those standards.

I cannot quite translate that into saying, we have to build 100 percent of them, though. And there, I think, there is the room for a balance which I am not prepared to set.

The **Chairman**. Dr. Merzbacher, since I have got you here, let me digress to another subject. The American Physical Society has issued some very good reports in the past on SDI.

Dr. **Merzbacher**. One.

The **Chairman**. Oh, just one?

Dr. **Merzbacher**. Yes.

The **Chairman**. Has that been updated?

Dr. **Merzbacher**. No. No, that stands where it was when it was issued two years ago and I have recently spoken with one of the coauthors, Dr. Bloembergen, who with Dr. Patel was the leader of the group that produced that, and Dr. Bloembergen is actually my successor. He is the president-elect of the American Physical Society, and just last week we talked briefly about that and he says that he feels that the report has been vindicated and has in fact—the conclusions have become stronger, if anything, in the intervening time.

The CHAIRMAN. There was a high degree of skepticism as to the deployment of SDI with that first report, was there not?

Dr. MERZBACHER. Yes. Specifically, directed energy weapons, not the entire SDI program. It addressed directed energy weapons.

The CHAIRMAN. Those conclusions have only been reinforced.

Dr. MERZBACHER. It stood the test of time, I understand.

The CHAIRMAN. I think that is all I have, Mr. Chairman. Thank you very much, Dr. Merzbacher and Dr. Drell.

Senator FORD. Dr. Merzbacher, I have one final question here, and I have been listening and according to the chart that you gave us here and we studied, do you—the majority of members of the American Physical Society are not high- energy physicists. That is, not potential users of the SSC. As President, you must have some idea of the degree of support for the SSC among your fellows who are not high-energy physicists. Can you tell us about the support for it?

Dr. MERZBACHER. The Society certainly has never taken any kind of a poll among its members.

Senator FORD. You have a feel of the pulse of it, do you not?

Dr. MERZBACHER. Well, I think almost all—not quite all, but almost all of us feel that it is a tremendously exciting venture intellectually and into an area that eventually people will move. Even if we did not do it now, certainly, people will move forward in that direction, and I certainly share that very much.

But there are certainly some people who think that this is not the time, we are not ready for it, there are better ways of exploring the universe, but I think that is a small minority, so on the whole I think you would find most people supportive of the idea, although many will wonder about the timing and the appropriateness.

Senator FORD. The problem is the siphoning off of money from other areas?

Dr. MERZBACHER. The effect on other parts of science, right—serious concern.

Senator FORD. Dr. Drell made a very passionate statement there earlier, said that this was such magnitude that the others would gravitate toward its use, and so that means that those skeptics now would gravitate toward the use.

Dr. DRELL. It is compellingly exciting, as is much of other physics, too, and I think the worry—and that is being reflected in Dr. Merzbacher's statement—is that it be done in a way that does not cause, shall I say atrophy, or further squeezing in other important areas of research in this country.

Senator FORD. Well, I say to the doctor, this is like baseball. You said enthusiasm in the spring should not wane in the fall. Well, there is not much enthusiasm except for the Cincinnati Reds, they went nine zip, you know, without losing the ball game, and lost the first one.

We have the World Series in the fall, and the excitement generates towards that time. So let us hope that when October 1 arrives that the budget looks good and things are on the move and we can prepare for next spring.

Dr. DRELL. I hope so.

Senator FORD. Thank you, gentlemen. This hearing is adjourned.

[Whereupon, at 1:13 p.m., the hearing was adjourned.]

APPENDIX

RESPONSES TO ADDITIONAL QUESTIONS

Department of Energy
Washington, DC 20585

June 7, 1990

The Honorable Wendell H. Ford
Chairman
Subcommittee on Energy Research
 and Development
Committee on Energy and Natural Resources
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

On April 24, 1990, Dr. James F. Decker, Acting Director, Office of Energy Research, gave testimony before your subcommittee on Superconducting Super Collider programs.

Prior to that hearing, you submitted written questions for our response to supplement the record. Enclosed are the answers to those questions.

If you have any questions, please have your staff call Barbara Campbell on 586-8687. She will be happy to assist you or your staff.

Sincerely,

Jacqueline Knox Brown

Jacqueline Knox Brown
Assistant Secretary
Congressional and Intergovernmental Affairs

Enclosure

PRE-HEARING QUESTIONS AND ANSWERS
FOR THE
APRIL 24, 1990, HEARING
BEFORE THE
SUBCOMMITTEE ON ENERGY RESEARCH AND DEVELOPMENT
COMMITTEE ON ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE
WITNESS: JAMES F. DECKER
ACTING DIRECTOR OF ENERGY RESEARCH

QUESTIONS FROM SENATOR FORD

I. Cost Estimate

Question 1:	The sum of as-spent dollars for the SSC project from FY 1988 through FY 1998 is estimated at $5.9 billion in Department of Energy budget justifications for FY 1990. DOE has since indicated that this cost will increase by $1 to $2 billion. How much is the increase: closer to $1 or closer to $2 billion?
Answer:	The Department is in the process of refining the cost estimates for the SSC project and is conducting a number of independent reviews of the SSC Laboratory's estimate. These reviews will be completed in the June time frame. The Department plans to have validated a cost estimate, along with a baseline design and schedule, in August of this year. A report on this new cost estimate will be provided to the Congress at that time. In the meantime, it is fair to say that the estimated cost increase is expected to be closer to the $2 billion number.

Question: When will we know the details?

Answer: The details will be provided to the Congress when the final cost estimate for the SSC project, along with the baseline design and schedule have been validated by the Department. This is expected to occur in August 1990.

Question: How did the need for this cost increase become apparent?

Answer: The need for this cost increase is related to two major factors: better estimates of schedule, updated funding profiles, labor, material, and tooling costs; and technical changes.

The technical changes arise from two technical factors related to so-called persistent currents in the magnets that were unknown at the time of the 1986 conceptual design and beam stability requirements to reduce the number of particles lost from the beam as it makes the 10 million turns necessary at injection. These two factors result in the need to increase the injection energy from 1 to 2 TeV, to increase the magnet bore diameter from 4 to 5 centimeters, and a slight increase in the circumference from 52 to 54 miles.

Question: Who recommended the increase?

Answer: The technical issues and design changes and corresponding cost increases were recommended by the SSC Laboratory. The estimated cost was reviewed and discussed within the Department, resulting in the indicated review and validation process to establish a baseline design, schedule, and final cost estimate for the SSC project.

Question: How was it approved at various levels within the Department?

Answer: A revised cost estimate has not been approved by the Department. Rather, increases in the cost have been discussed with the SSC Laboratory and a number of independent reviews of cost and design are underway. A revised cost estimate will not be approved by the Department until these reviews are complete and the costs have been validated by the Department.

The need for the design changes recommended by the SSC Laboratory has been reviewed and endorsed by the High Energy Physics Advisory Panel (HEPAP) Subpanel on SSC in January 1990. This Subpanel felt strongly about the need for a flexible and reliable facility at 20 TeV for decades to come and concurred with the SSC Laboratory on the logic of making the technical design changes described above. The HEPAP recommendations have been accepted by the Secretary.

Question: Explain the origin of the cost increases.

Answer: The cost increases derive primarily from the need to incorporate design changes in the SSC particle accelerator based on new information on technical issues not known at the time of the 1986 conceptual design. In addition, we now have a better understanding of the schedule, funding profile, manpower, labor and tooling costs and a site specific conceptual design.

Question: How will the new cost estimates be derived?

Answer: The new cost estimates will be based on a "bottoms-up" cost estimating procedure conducted by the Laboratory and reviewed by DOE. This estimate will be based on the site specific conceptual design and will account for the technical information and knowledge of magnet and accelerator performance now available since the time of the 1986 conceptual design. The cost estimate will be derived from individual component and subsystem cost estimates for the technical systems and the civil construction aggregated with capital equipment and operating costs to define a total cost for the project. Further details for the proposed civil construction will be developed as part of detailed design activities.

Question: Who will do the estimation?

Answer: The SSC Laboratory will develop the basic cost estimate. This estimate will then be reviewed in the Department by two independent groups. These groups are organized by the Office of Energy Research's Construction Management Support Division and by the Department's Independent Cost Estimating staff to validate the estimates for cost, schedule and baseline design proposed by the SSC Laboratory. In addition, the Secretary has requested a third independent review of the cost estimate by a Subpanel of the HEPAP to report on the validity of the cost estimate.

Question: Who will check it?

Answer: The Department will review in depth the SSC Laboratory baseline estimate through a committee established in the Office of Energy Research, which includes outside consultants, and through its Independent Cost Estimate group which is not located in the Office of Energy Research. In addition, the High Energy Physics Advisory Panel (HEPAP), a DOE Advisory Committee, will review the cost and methodology and provide an independent check of the above mentioned Departmental reviews.

Question 2:	Initially, DOE indicated that the project would have to be built for the original $5.9 billion total estimated cost. Subsequently, DOE reversed this requirement and embraced the need for a cost increase. Explain why this decision was made.
Answer:	The Secretary was convinced by the evidence and persuasive arguments of HEPAP that a $5.9 billion cap would not be wise. No one wants to spend billions of dollars and build an accelerator that doesn't work, or that operates in a marginal fashion that impedes conducting the experiments for which it was commissioned. The Secretary is convinced, on the basis of the HEPAP Subpanel's recommendations, of the need to make the recommended design changes to provide a flexible and reliable facility at 20 TeV for high energy physics research for decades to come. The SSC represents this nation's commitment to excellence in science and technology into the 21st century and must be designed and built to produce the research capabilities expected.

Question 3:	DOE and Universities Research Associates previously had been quite confident that the $5.9 billion estimate would not increase. Are you confident that this new estimate won't be replaced with a higher value? Why or why not?
Answer:	We are confident that we are doing everything possible to establish the proper cost estimate. The Secretary is committed to establishing the best estimate of cost for the SSC that is possible at this time. The Department will review and validate the estimate proposed by the SSC Laboratory; the HEPAP Subpanel independently will review both the Laboratory's estimate and the Department's validation of the cost, baseline design and schedule. The estimate will include an allowance for contingency for unforeseen technical risk and uncertainties in the cost to construct the facilities. We also will have tight management controls as we proceed with the project.

Question 4: Is there an upper limit to the cost of the project that would trigger reconsideration of the project? What is that limit?

Answer: There is a limit to the expenditure of funds in this period of tight budgets and many demands but we do not know what it is. In considering cost and benefits of the SSC project I am particularly struck with the potential of this project to contribute to science and our fundamental understanding of the world around us. We cannot predict all the spin-offs and benefits that will result from this project and will contribute to our position as a world leader in technology and to our economic competitiveness.

Question 5: **Who is responsible for monitoring the costs of the project?**

Answer: The Secretary's memorandum of September 7, 1989, establishes the basic management organization, authorities and responsibilities for the SSC project. Specifically, the Secretary has set up a management organization that is unique in the Department, with the Project Manager on-site in Texas reporting directly to the Headquarters Program Manager, and separately to the Secretary. This clear line of responsibility, authority and reporting is designed to provide for early identification of problems and to ensure their resolution in a timely manner. The costs of the project will be monitored by the Project Manager and reported directly to the Program Manager and, as appropriate, to the Secretary.

Question: How does this monitoring work?

Answer: The Secretary has authorized an on-site Project Office for SSC to work directly with the Laboratory on a day-to-day basis to oversee project activities and to monitor technical progress as well as cost. The SSC Laboratory will provide periodic reports on progress and project expenditures; the Project Manager and Program Manager in the Office of Energy Research (ER) will conduct periodic reviews on the status and technical "well-being" of the project. This reporting and review process, combined with independent reviews by ER's Office of Construction Management and the DOE office for Independent Cost Estimating as required by DOE Orders, will serve to provide the necessary information for DOE to exercise its management responsibilities in oversight of the Management & Operating (M&O) contractor, University Research Associates.

Question: To whom are the results reported?

Answer: The Project Manager will monitor costs and report these to the Program Manager in Headquarters and to the Secretary as appropriate. This reporting by line management is in addition to the formal review process of the Department's Energy System Acquisition Advisory Board (ESAAB) for major projects in the Department. This process provides information on the cost, schedule and technical progress, as well as a mechanism for a formalized decision process for major acquisition milestones for the project.

Question: What is the process if it appears that new cost increases are occurring or may be required?

Answer: The Project Manager will first try to understand the reasons for the increase and will keep the contractor working on the problem to maintain the cost. If it appears that nothing can be done to keep the cost to the original level, the Program Manager at Headquarters, the Deputy Secretary as Acquisition Executive, and the Secretary will be informed through the Energy System Acquisition Advisory Board (ESAAB) process. Appropriate strategies will then have to be developed, such as reducing the scope of the project or requesting an increase from OMB and the Congress.

Question 6: Will the next cost estimate, including the $1 and $2 billion increase, establish a new cost base line against which management will evaluate performance? If not, what is the base line for cost measurement?

Answer: The cost estimate to be developed and validated during the summer of 1990, will be a site-specific cost estimate for the Ellis County, Texas, site and will establish the baseline for the design and construction to follow, against which performance will be evaluated. Performance will be evaluated in accordance with published DOE orders.

Question : How does information about actual costs relative to this base line get to the responsible officials?

Answer: Progress of the project relative to this cost baseline will be tracked by the DOE On-Site Project Office on a continuous basis and will be reported in monthly progress reports. Semi-annual program reviews with outside consultants will also be held to assess progress against established milestones. This information will be reported to the SSC Program Manager at Headquarters and the Director of Energy Research. Costs, relative to baselines, are also reported quarterly to the Deputy Secretary as the Acquisition Executive.

Question: Who are the responsible officials?

Answer: The Project Manager at the on-site office will be responsible for day-to-day progress of the project and control of all Category II (intermediate) milestones. The SSC Program Manager at DOE Headquarters will have overall responsibility for the SSC and will control all Category I (top level) milestones. The SSC Program Manager reports to the Director of Energy Research.

Question: How often is this information reviewed and evaluated?

Answer: The project progress will be continuously reviewed at the Texas on-site project office level, and will be formally reviewed through monthly reports and semi-annual reviews by the SSC program office in DOE Headquarters. Quarterly reports and independent assessments of the technical aspects, cost and schedule are also provided to the Deputy Secretary as Acquisition Executive. Significant problems can be reviewed at any time.

Question: Who does the review and evaluation?

Answer: The on-site staff under the supervision of the Project Manager, and the Headquarters staff under the supervision of the Program Manager, will conduct the reviews and evaluations. At the Texas Project Office there will be, ultimately, up to 60 staff, and at Headquarters up to 30 staff. Independently, DOE Headquarters' Office of Project and Facilities Management will assess the project.

Question 7: Who should Congress hold responsible for control of costs for the project?

Answer: The Secretary of Energy has ultimate responsibility for the cost of the SSC program. Information on project cost will go to the Secretary from the Director of Energy Research through the Deputy Secretary, who has responsibility for the DOE Energy Research programs. The Secretary also will receive reports directly from the Texas on-site Project Manager.

Question: Describe the extent to which this person has control over costs.

Answer: The on-site Project Manager will have direct control over project cost through change order and milestone approvals and contingency allocation to the SSC Laboratory consistent with the authority of DOE specified in the Project Management Plan. The Deputy Secretary controls key decision milestones established for the project and can direct a review of the project costs at any time based on the reporting and independent assessments provided to him.

Question:	Describe the influences built into the project that tend to minimize costs.
Answer:	The project will utilize a formal change control program with specified levels of approval to control milestones and costs. A value engineering program will be instituted in accordance with DOE policy to encourage cost reduction. This value engineering program will be set up to encourage contractors with incentives to reduce costs without sacrificing required quality or function. Contract work will be competitively bid with fixed price contracts utilized whenever possible. The fact that the M&O contractor has been put through a rigorous design and cost review also will tend to keep changes and cost to a minimum.

II. Management Structure

Question 1:	**What are the principal alternatives for SSC management structure available to you?**
Answer:	In establishing DOE's Office of Superconducting Super Collider, the Secretary of Energy considered creating the office as an independent, self-contained office. Such a structure, however, would have ignored the close ties which the SSC project has to the Office of High Energy and Nuclear Physics (HENP) and the need for close cooperation between the offices. In fact, the office originally was contemplated as a division of HENP. Structuring the OSSC as an office within the Office of Energy Research and a co-equal with HENP, appeared to be a compromise which ensured continued close ties with HENP while providing appropriate visibility within the Department. To provide a single line of management responsibility, the Secretary determined that there would be a site office located near the Laboratory which would report to the Director, OSSC. This reporting line is unusual for DOE where most site offices report to a field operations office. Also arguing against the concept of an independent office was the size of the staff needed to fulfill all of the functions of such an office. When weighing these needs, the Secretary determined that DOE's Chicago Operations Office, which had been providing administrative support to the SSC project and was matrixed to provide a full complement of administrative services, would continue to provide these services to the site

office component of the OSSC. Within Headquarters, the OSSC would obtain support from other elements of the Department in a similar manner to other Energy Research programs.

Question 2: **Does the management structure of the project include any review mechanism involving persons from the private sector experienced in the construction of projects of the scale of the SSC? If not, why not?**

Answer: Similar to other DOE major projects, the SSC project is subject to validation reviews by the Office of Projects and Facilities Management. This office routinely uses private-sector contractors with major project experience to assist in validating the proposed cost, schedule and technical baseline of new projects. Also, as a component of the Office of Energy Research, the SSC project is subject to independent reviews by ER's Office of Construction Management which brings in independent reviewers with large project experience. Due to the potential conflicts of interest, there are limitations on the use of outside reviewers. In addition, experts with private sector construction experience may be made available, through the High Energy Physics Advisory Panel (HEPAP).

Question: What is the role of the High Energy Physics Advisory Panel in the management of this project?

Answer: The HEPAP is an advisory body to the Secretary of Energy on the National High Energy Physics Program including the conduct of experimental and theoretical research and SSC activities. HEPAP is not directly involved in the management of the project or the Laboratory. However, HEPAP can be asked to provide management advice in specific areas of concern.

HEPAP is charged with: providing periodic reviews of the high energy physics program, including SSC, and making recommendations for changes considered desirable on the basis of scientific and technological advances or other factors; providing advice on long-range plans, priorities and strategies for the National High Energy Physics Program and on recommended levels of funding to assure a world leadership position; and providing advice on any issues relating to the program as requested by the Secretary or the Director of Energy Research.

Question: What experience does HEPAP have with the construction of projects on the scale of the SSC?

Answer: HEPAP is a formal DOE advisory panel which was first chartered in January 1967. As a Federal advisory panel, HEPAP has no direct role in the construction or operation of DOE facilities. HEPAP's role is to assess scientific needs and priorities, recommend which facilities should be constructed, and recommend priorities for facility operations. The responsibility for actual construction and operation of the large high energy physics facilities rests with the Department and its management and operating contractors.

Question 3: Who has the management responsibility for the project, URA or DOE? Explain.

Answer: URA is the prime contractor responsible for designing, constructing, and operating the SSC. DOE will oversee and monitor progress and assure that the project is managed properly. DOE ultimately has the management responsibility for the project.

Question: I understand that the previous Director of Energy Research proposed a much stronger role for DOE Headquarters (with higher numbers of FTEs in DOE) in managing the project than was adopted by Secretary Watkins in his September 1989 SSC Management Plan.

Answer: The previous Director of Energy Research had proposed the OSSC to be an independent and self-contained office capable of providing the full range of program and project needs. Such an office is extremely staff intensive. The Secretary's September 1989 plan called for up to 30 FTE's at Headquarters and up to 60 FTE's at the site office; but the Headquarters office has full access to staff within the budget, procurement, counsel, personnel and other staff offices of the Department and the site office has full access to the matrix support of the Chicago Operations Office as well as the staff which Chicago has provided to and collocated at the site office.

Question: Why was the weaker role for DOE selected? What were the advantages and disadvantages of the alternatives considered in that decision?

Answer: DOE does not have a weaker role with respect to this project under the Secretary's management plan than that proposed by the previous Director of Energy Research. Obviously, one of the factors considered in the Secretary's decision was the number of staff slots which were available within the Department for the new office. The decision to use matrix support from the Headquarters and Chicago Offices was based, in part, upon resources available; but it is important to note that the matrix support available, both in numbers and in talent, far exceeds what the SSC could have hoped to staff to. For example, within the Offices of the General Counsel at Headquarters and Chicago, the SSC can draw upon the talents of lawyers with international, procurement, patent and environmental skills; similar examples can be cited within each of the DOE staff offices. The fact that the SSC is a Presidential and Departmental priority is sufficient to ensure that the project is well supported by the staff offices.

Question: Discuss the role of the DOE Office of Superconducting Super Collider under the September 1989 plan.

Answer: The DOE-OSSC, as provided in the Secretary's SSC Management Plan, consists of a Headquarters office headed by a Program Manager who reports to the Director of Energy Research and a Project Office in Texas headed by a Project Manager who reports to and receives guidance from the Program Manager. Administrative support for the Headquarters Office is provided by DOE staff offices at Headquarters and for the Project Office is provided by the Chicago Operations Office.

The Program Manager's responsibilities include ensuring compliance with all applicable Federal, State and local regulations during the design, construction and operation of the SSC; SSC policy formulation; negotiation with foreign governments to establish collaborative arrangements; technical, safety, environmental, managerial and financial oversight; project cost and schedule; and the provision of contracting officer and procurement authority. The Program Manager interfaces with the President of the prime contractor, the SSC Laboratory Director and the High Energy Physics Advisory Panel. Within 6 months of appointment, the SSC Program Manager is to provide a definitive management plan to the Secretary which may alter the current management structure.

Question: Discuss the role of the SSC Project Office.

Answer: The Project Manager at the site office closely monitors progress against program objectives and independently reports to the Secretary on the technical health of the project, progress against schedule milestones and project cost estimates, and other matters of importance to the Secretary. The Project Manager interfaces with the SSC Laboratory Director and Program Manager.

Question: Discuss the role of URA.

Answer: URA will be responsible for all aspects of the management, technical direction, design, construction, operations and maintenance of the SSC Laboratory facilities, including preconstruction R&D; selection and subcontracting for Architect-Engineering/Construction Management (A-E/CM) services and all technical systems; management of construction and component fabrication; development of the requisite scientific, technical, and administrative infrastructure; laboratory management; and technical interfacing with foreign suppliers.

Question: Discuss the role of the DOE Chicago Operations Office in project management.

Answer: The Secretary's plan provided for the Chicago Operations Office to provide administrative support to the SSC Project Office. The Manager of the Chicago Operations Office provides staff at the site and, currently, Chicago has provided a Contracting Officer; an Engineer; and Contracting, Industrial Relations, Personnel, Budget, and Administrative Specialists at the site office. Chicago also makes available to the Project Office its full matrix staff including environment and safety engineers, real estate specialists, counsel and others.

Question: Explain why the arrangements discussed represent the best choice among the alternatives that are available.

Answer: The current management scenario provides for the most efficient use of human resources and combines the best of DOE's traditional management practices (i.e. use of the talents at the field offices in project management) with techniques new to DOE, such as having the project office report directly to the program office responsible for overseeing the success of the project. The placement of the Office of Superconducting Super Collider within the Office of Energy Research ensures the communication and close cooperation between the OSSC and the Office of High Energy Physics for whom the SSC Laboratory provides the research tool for the next century.

Question 4: What is the base line plan for measurement of progress in the project?

Answer: The baseline cost estimate and selected milestones from the Project Master Schedule will form the basis for measuring project progress.

Question: How is progress measured?

Answer: The project is required to implement the Department's Cost/Schedule Control System for contract performance measurement. This "earned value" system requires that the actual value associated with completed milestones and work be compared with the corresponding value in the project baseline and that variances be reported and evaluated.

Question: Who is responsible for measuring progress?

Answer: The SSC Laboratory will set performance goals at the outset of the contracts and will track progress. Oversight will be provided by the DOE on-site Project Office.

Question: How does this person obtain the information necessary to monitor progress?

Answer: The SSC Laboratory will obtain the information necessary to assess progress through monthly contractor reports and on-site verification. The DOE Project Manager will receive monthly progress reports.

Question 5: How much of the design for the project has been completed?

Answer: The conceptual design of the project will be completed within one month. The site specific conceptual design report will be submitted to the Department on May 21, 1990, and distributed to reviewers prior to an on-site review in June.

Question:	When do you expect to have a complete design?
Answer:	The complete system design for the accelerator is scheduled for completion in April 1994.

Question: Could further design work increase the cost of the project?

Answer: The design revisions recommended by the SSC Laboratory and accepted by the Department make the project design much more conservative and reduce the technical and operating risks. The project cost estimate currently being developed includes a contingency/allowance which is estimated to be between 15 and 20 percent, which is based on a risk analysis of technical, cost and schedule aspects of the various project elements in the revised conceptual design. We do not anticipate significant cost increases as the design is refined.

Question: Can you estimate how this might happen?

Answer: It is believed that the site specific conceptual design is conservative in meeting the design and performance objectives of the SSC. Studies will confirm specific design choices and, thus, narrow uncertainties in the overall design.

Question 6: How are contracts and subcontracts let for the project?

Answer: Most contracts for the design and construction of the SSC project will be awarded by the SSC Laboratory, which is managed and operated by Universities Research Association, Inc. (URA). As a management and operating contractor of the Department of Energy, URA is required to follow the "Federal norm" in awarding its contracts. The Federal norm would require that subcontracts issued by the Laboratory be awarded on a competitive basis.

Question: Who is responsible for contracting.

Answer: The URA staff at the SSC Laboratory is responsible for contracting. The DOE staff at the Texas site office approves most subcontracts; the Secretary of Energy approves awards in excess of $25 million.

Question: Who is responsible for monitoring contract performance?

Answer: The URA staff at the SSC Laboratory is responsible for monitoring contractor performance. DOE's Office of Superconducting Super Collider has responsibility for oversight of the Laboratory's contracting and monitoring functions.

Question 7: **Who is responsible for testing and evaluation of components of the system?**

Answer: **The SSC Laboratory is responsible for testing and evaluating the system and its components as part of the installation and commissioning of the SSC accelerator facility.**

Question: What are the test schedules?

Answer: Accelerator component tests have been going on since 1985, as part of the research and development process, and will continue until early in 1998. Test emphasis is placed on those components with the highest impact on accelerator availability. For instance, superconducting magnets will be cold tested before installation and then again, by sectors, once installed in the tunnels.

III. Appropriations

Question 1:	For each state, show, for FY 1990 -- the number of contracts awarded, who received awards, and the dollar value.
Answer:	I will be pleased to provide this information for the record.

(The information follows:)

April 25, 1990

STATE	COMPANY	AMOUNT
Alabama	VME Microsystems International Corp	1495.00
Arizona	Alpha Graphics	44.68
Arizona	Arizona State	50000.00
Arizona	Motorola	208.00
Arizona	Eurorep Systems & Sales	10635.00
Arizona	Jensen Tools	8540.67
Arizona	U-Haul International Inc Credit & Bank Serv Dept	1055.00
Arizona	Vita Intntional Trade Asc Assoc	34.95
California	ADP Apple Computer Inc	20.00
California	Advance Engineering	40047.60
California	Allens Press Clipping Bureau	309.64
California	Apple Computer Inc APDA File	1000.00
California	ASI	2760.00
California	ASP Inc Dept	251.75
California	Cal Central Press	28644.45
California	Calcomp Inc	549.00
California	Cisco Systems Inc Department	6335.00
California	Dariana Technology Group Inc	75.00
California	Delta Microsystems Inc	700.00
California	Dialog Information Serv	2000.00
California	Digital Planners Inc	63019.97
California	Dilog Accounts Receivable Dept	9908.00
California	Diversified Info Serv Inc	29300.00
California	Dowling Mimer Magnetic	50.00
California	DSP Technology Inc	2793.60
California	EG&G Inc-Energy	340500.00
California	Farallon Computing Inc	50.00
California	Federal Communications Co	931.20
California	Furukana Electric Co	185035.00
California	G M Proctor & Sons	610.00
California	Global Engineering	3500.00
California	Hewlett Packard Direct Marketing Division	850.00
California	Humphreys & Assoc Inc	10095.49
California	Hyspan Precision	12080.00
California	IISSC	1125.00
California	JJ VanHouten & Assoc Inc	122939.00
California	Lawrence Berkeley Lab Accounting/Financial Mgt	5599586.00
California	Lawrence Livermore Lab	19505.00
California	Marshall Industries	231.48
California	Micro Math Systems	530.00
California	Microsim Corporation	3650.00
California	Network Computing Devices Inc	3050.00
California	Next Inc	20890.00
California	Oracle Direct Sales	398.00
California	Paracomp Inc	179.00
California	Pearson Electronics Co	4200.00
California	Performance Mgmt Assoc	885.00
California	Personal Training Systems	199.80
California	Polaris Software	15.00
California	QMS Inc	85066.20
California	Ross Engineering Corp	2163.00
California	RTK	5214999.50

STATE	COMPANY	AMOUNT
California	Schweber Electronics Dept	155.86
California	Science	169900.00
California	Shomex Productions	5500.00
California	SHPE Inc	2000.00
California	SLAC-PPF	72.00
California	SPEC	450.00
California	Standard Crystal	166.30
California	Stanford Linear Accel	274158.00
California	Stanford Research	10330.00
California	Sun Microsystem	1180.00
California	Superconductor Appl. Assn	900.00
California	Sybase	900.00
California	Talaris Systems Inc	12132.00
California	Tokin America Inc	1710.00
California	Tor L. Breeke Inc	14000.00
California	Tutsim Products	1348.00
California	University of Calif at Berkeley	5.00
California	Versatec	161.00
California	Vitex Systems	895.00
California	Whittaker Corporation	2400.00
California	Xerox Corp	166.80
California	Xerox Corporation	332731.28
California	Tokin America Inc	1709.82
Colorado	Advanced System Design	359.85
Colorado	Brierley & Lyman Inc	25000.00
Colorado	Buehler Moving & Storage	99999.99
Colorado	Cryoco	575.00
Colorado	Golden Software Inc	10.00
Colorado	JSD Simulation Service Co	22000.00
Colorado	Lachel Piepenburg Assoc Inc	60000.00
Colorado	Martin Marietta Corp	44988.00
Colorado	Official Airline Guides Travel Planner	342.00
Connecticut	ISSC Inc IGC Advanced Superconductors	1250.00
Connecticut	Williams Tel	36687.00
District of Columbia	AT&T	1871.46
District of Columbia	Carroll Publishing Co	27.00
District of Columbia	Chaparos Production Ltd Graphic Designers Inc	1500.01
District of Columbia	U.S. Government Printing Office	1000.00
District of Columbia	Educom	3408.90
District of Columbia	Federal Publications Inc	745.50
District of Columbia	Gimeor Inc	100.00
District of Columbia	Washington Legal Foundation	100.00
Delaware	BT&D Technologies	330.00
Florida	Deneba Software	30.00
Florida	F W Bell Inc	2145.00
Florida	Insulator Seal Inc	712.50
Florida	Seawark Corporation	52.00
Florida	Tensolite Company	1440.00
Florida	University of Florida	850.00
Georgia	Ashrae Publication Sales	53.00

STATE	COMPANY	AMOUNT
Georgia	Boise Cascade Off Product	226.26
Georgia	Digital Equipment Corp	736727.78
Georgia	Harris Corporation	68400.00
Georgia	Int. Furniture Sys.	15709.01
Georgia	Intermec South Inc	20899.00
Georgia	NEC America	28.00
Georgia	Nynex Business Centers	6881.82
Georgia	Prentice Hall	63.60
Georgia	Programmed Intel Corp	5750.00
Georgia	Science Applications International Corp	74900.00
Georgia	Sears Commercial Credit	3113.00
Georgia	Sun Microsystems	301067.00
Georgia	Western Union	5262.54
Hawaii	TJET Sun	3600.00
Idaho	A 1 Consolidated	14207.01
Illinois	Allied Van Lines	99999.99
Illinois	American Institute of STL	93.00
Illinois	Argonne National Lab	49500.00
Illinois	American Society of Safety Engineers	22.00
Illinois	Associated Research Inc	1750.00
Illinois	AT&T	2495.00
Illinois	Bacons Publishing	155.00
Illinois	Balzers	28832.00
Illinois	Calcomp Inc	70202.95
Illinois	Commerce Clearing House	4370.62
Illinois	Curtin Matheson Scientific Inc	3915.05
Illinois	Dartek Computer Supply	1214.50
Illinois	Datability Software Sys	13093.00
Illinois	Department of Energy Chicago Operations Office	250000.00
Illinois	Dour Metal	274571.00
Illinois	Equipto Electronics Corp	280.00
Illinois	Ernst & Young	50000.00
Illinois	Fermi National Accelerator Lab	10913462.00
Illinois	ILL Inst/Cont Legal Edu	79.50
Illinois	IPC	800.00
Illinois	Mcmaster-Carr Supply Co	751.48
Illinois	Media Tech Inc	12.50
Illinois	HAC	21.60
Illinois	Lynn Machine & Tool Corp	76,389.00
Illinois	National Safety Council	115.00
Illinois	Newark Electronics	6184.83
Illinois	Numerical Algorithms Grp	1890.00
Illinois	Outokumpa Metallverken	52775.00
Illinois	P V S Corp Services	15.00
Illinois	Porter Cable Corp	539.00
Illinois	Soft Warehouse Inc	73278.85
Illinois	Source Equipment Co	5156.82
Illinois	Tektronix Inc	234167.25
Illinois	The New York Times	307.00
Illinois	Universal Technical Syst	1130.00

STATE	COMPANY	AMOUNT
Illinois	Vector Fields Inc.	4000.00
Illinois	Walco Tool & Engineering Br #3	4544.00
Illinois	Wolfram Research Inc	1590.00
Indiana	Int. Furniture	5452.00
Indiana	International	7113.00
Kansas	Triad Solutions	495.00
Kansas	Western Air Maps Inc	265.00
Kentucky	Pitney Bowes Inc	1000.00
Kentucky	The Drawing Board	44.95
Kentucky	UPS Customhouse	7.00
Louisiana	Natl Society of Black Physicists	290.00
Maine	Fluid Systems Inc	7000.00
Maryland	Bureau of National Affairs Inc	4900.00
Maryland	Chas G Stott & Co Inc	11700.00
Maryland	Congressional Quarterly Cust Ser & Dist	59.95
Maryland	Eil Instruments Inc	696.00
Maryland	Falcon Microsystems Inc	750.00
Maryland	Lucas-Weinschel Engineer	2480.00
Maryland	Oxford Superconducting Tech	421335.21
Maryland	Scinta Inc	84.00
Maryland	Trade Associates Inc.	2900.00
Massachusetts	Access Technology	17218.66
Massachusetts	Aimline Accounting Support Inc	825.00
Massachusetts	Analogic Corp	4695.00
Massachusetts	Applied Reasoning Corp	3150.00
Massachusetts	Brandeis University	56653.00
Massachusetts	Cabletron Systems Inc	38164.25
Massachusetts	Commonwealth Films Inc	455.00
Massachusetts	Cognos Corporation	10396.00
Massachusetts	Digital Equip Corp	45.00
Massachusetts	EG&G, Inc.	225.00
Massachusetts	GEN RAD Inc	1950.00
Massachusetts	Government Tech Ser Inc	28960.00
Massachusetts	Harvard Univ Press Publishing Operations Dept	31.50
Massachusetts	Hewlett Packard	1090.00
Massachusetts	Input Output Comp Serv	2519.00
Massachusetts	Integrated Computer Sol Inc	900.00
Massachusetts	Layered Inc	99.00
Massachusetts	Merida Trading Group	15500.00
Massachusetts	Michell & Gauthier Assoc	6987.00
Massachusetts	Micro-way Inc	7.00
Massachusetts	MIT	50000.00
Massachusetts	National Fire Protection	172.00
Massachusetts	O.S. Walker Co. Inc.	1375.00
Massachusetts	Open Software Foundation	2000.00
Massachusetts	Powers Associates Inc	13072.58
Massachusetts	R S Means Company Inc	175.45
Massachusetts	Saber Software Inc.	2895.00
Massachusetts	Spiral Software	223.00
Massachusetts	Supercon Inc	139996.00

STATE	COMPANY	AMOUNT
Massachusetts	The Programmer's Shop	1339.00
Michigan	Gale Research Inc	4496.55
Michigan	Leco Corporation	19129.59
Michigan	The Univ of Michigan	36300.00
Michigan	Weldon International	28286.04
Minnesota	Business People Inc	4800.00
Minnesota	Deluxe Computer Forms	3547.10
Minnesota	Itasca Consulting Group Inc	3500.00
Minnesota	OTC Power Team	51350.00
Minnesota	Viking Acoustical Corp	767.90
Minnesota	West Publishing Co	1013.00
Minnesota	West Services Inc	1250.00
Missouri	Datastorm Technologies	25.00
Missouri	Global Engineering	1490.00
Missouri	Keye Productivity Center	281.00
Missouri	McDonnel Douglas Corp	140432.00
Missouri	United Van Lines	103999.99
Missouri	Worldwide Directory Products Sales	97.10
Nebraska	Radon Measurements Lab	448.00
New Hampshire	Cabletron Systems	38164.00
New Hampshire	Digital Equipment	4470.00
New Hampshire	Mac Connection	25.00
New Hampshire	New England Electric Wire	15517.01
New Jersey	Airlogic	641.00
New Jersey	American Society of Civil Engineers	228.00
New Jersey	American Society of Mechanical Engineers	1137.00
New Jersey	ASME	19.00
New Jersey	Bellcore Distribution Center	229.00
New Jersey	Blickman Equipment Corp	2880.00
New Jersey	Boontom Electronics Co.	3495.00
New Jersey	Datapro Research Corp	3012.00
New Jersey	Glassman High Voltage Inc.	2275.00
New Jersey	IEEE Services Center	509.00
New Jersey	John Wiley & Sons Inc.	179.80
New Jersey	LeCroy Corporation	8284.80
New Jersey	Macwarehouse	163.00
New Jersey	McGraw-Hill Pub	94.00
New Jersey	New Breeding Moving Corp	7600.00
New Jersey	Prentice-Hall	1415.55
New Jersey	Princeton Univ	27,439.69
New Jersey	Vacuum Schmelie	192100.00
New Jersey	World Scientific	940.00
New Mexico	Bira Systems	4615.00
New Mexico	Eberline Instrument	1700.00
New Mexico	LeCroy Corporation	12400.00
New Mexico	Los Alamos National Laboratory	770776.00
New Mexico	McBridge Micro Source Inc.	53530.26
New York	American National Standards Institute Inc	1107.16
New York	Avtech Electrosystems Ltd	6540.00
New York	Brookhaven National Laboratory	11237794.86

STATE	COMPANY	AMOUNT
New York	Advertising of Dallas	100000.00
New York	Cornell University	7.00
New York	Designtex Fabrics Inc	185.00
New York	Deutsch, Shea & Evans Inc.	57.96
New York	Ebesco Services	31000.00
New York	Evans Materials Handling	616.00
New York	Gaylord Brothers	846.00
New York	Gordon & Breach Publisher	1118.00
New York	Hearst Business Communications Inc	290.00
New York	Intermagnetics General Corp	684389.76
New York	Jack O'Dwyer Co Inc	94.00
New York	Jorway Corporation	16050.00
New York	Lexicon Publications	149.25
New York	Logical Training Systems	6113.00
New York	Meuser Rutledge Engineers	14000.00
New York	Microwave News	250.00
New York	Mini-Circuits	4734.55
New York	Monitor Publishing Co	405.00
New York	Physics Today Magazine	85.00
New York	Plenum Publishing Corp.	1849.50
New York	The Society of Women Engineers	2010.00
New York	Van Nostrand Reinhold	221.80
New York	Xerox Corporation	12000.00
Nevada	Citicorp Diners Club	13099.75
Nevada	EG&G Inc-Energy Measurements	316000.00
North Carolina	ACRO Print Time	66.00
North Carolina	Egghead Discount Software	16459.23
North Carolina	Fluke Manufacturing Co	29082.78
North Carolina	HJC Software	75.00
North Carolina	Information Handling Serv	300.00
North Carolina	Technical Services Corp	7650.00
Ohio	ASM International	2690.85
Ohio	Career EXPO	2500.00
Ohio	GF Furniture Systems Inc	1500000.00
Ohio	Hamilton Caster & Mfg Co	1386.08
Ohio	Kelley Communication Development	32.95
Ohio	Monarch Marxing	8153.50
Ohio	Pruitt Energy Sources Inc	6337.75
Ohio	R & K Supply Company	554.50
Ohio	Roadway Express Inc	82.07
Oklahoma	Data Com	809.25
Oklahoma	DRD Corporation	8500.00
Oklahoma	P & R Supply Co Inc	7658.96
Oklahoma	Teaco Inc	1885.00
Oregon	Aronson Campbell Ind Sply	6428.37
Oregon	Blue Sky Research	4530.00
Oregon	Central Point Software	25.00
Oregon	Jackson Machine	160252.00
Oregon	Northlake Software Inc	2565.00
Oregon	Orcad Systems Comp	2485.00

STATE	COMPANY	AMOUNT
Oregon	Oregon State University	109913.00
Oregon	Teledyne	18951.46
Oregon	The Logical Company	1870.00
Pennsylvania	Air Products & Chem Inc	25000.00
Pennsylvania	Algor Interactive Systems Inc	895.00
Pennsylvania	Clement Communication Inc	996.00
Pennsylvania	College Placement Council	895.00
Pennsylvania	Day Timers Inc	111.65
Pennsylvania	Emery Worldwide	71.00
Pennsylvania	Genesis Imaging Tech Inc	20669.00
Pennsylvania	National Journal Inc	42.45
Pennsylvania	Project Management Institute	1397.00
Pennsylvania	Sweet's Group	2256.05
Pennsylvania	Techni-Tool Inc	2649.86
Rhode Island	American Mathematical Soc	49.00
Rhode Island	Texas Users Group	750.00
Tennessee	Federal Express	20000.00
Tennessee	Hunley & Packard Inc	276.00
Tennessee	Oak Ridge National Laboratory	88931.00
Tennessee	Preferred Publishers	15.00
Tennessee	U.S. Department of Energy	14.41
Texas	2M Office Supply	1643.38
Texas	3D Technologies Inc	286.00
Texas	A. J. Rod Company Inc	5335.00
Texas	ABCO Office Supply	13474.13
Texas	Accent Audio Video	15766.34
Texas	Ace Worldwide Moving and Storage	99999.99
Texas	ACME Rubber Stamp	18.47
Texas	Advanced Freight Management Sys	380.00
Texas	Advanced Image Systems Inc	220.00
Texas	Advanced Telecom	4602.01
Texas	All American	1335.50
Texas	All Pest Exterminators	305.00
Texas	Allegro Systems Inc	3150.00
Texas	Allied Interiors Access Floor Specialists Inc	40.00
Texas	ALP Printing Inc	47.00
Texas	Alpha-Delta Office Supply	80.88
Texas	Alternative Technology	590.00
Texas	Amer 1 Hour Photographics	204.80
Texas	American Laser Products	5362.40
Texas	Anixter-Distribution	80653.30
Texas	Apple Corporates	180000.00
Texas	APW Productions	1584.50
Texas	Archive Supplies Inc	2877.89
Texas	Aric's Lock and Key	192.30
Texas	Armstrong/United Van Lines	8998.00
Texas	Asel Art Supply	5779.64
Texas	AT&T Consumer Products	311.60
Texas	AT&T Federal System	193453.36
Texas	Automated Information Management	3754.00

STATE	COMPANY	AMOUNT
Texas	Automation Image Inc	596.00
Texas	Aviles Engineering Corp	3323.00
Texas	AVW Audio Visual Inc	33156.00
Texas	B&F Construction Services	2600.00
Texas	B&H Antenna Systems	768.70
Texas	Baldwin Metals Co Inc	2598.00
Texas	Barry's Camera & Video	2211.63
Texas	Bass & Hays Electronics	9148.84
Texas	Bayshore Surveying Instrument Co Inc	35.00
Texas	Bell Industries	3255.00
Texas	Bernard Hodes Advertising	44626.00
Texas	Betsy Ross Flag Girls	340.00
Texas	Big Three Welding	7798.70
Texas	Bill Green & Associates	6694.80
Texas	Binding Systems of Dallas Inc	15640.82
Texas	Blind Spot	617.00
Texas	Bluebonnet Tool Co Inc	135.60
Texas	Bowman Distribution	588.95
Texas	Brainz Unlimited Inc	3180.00
Texas	Browning-Ferris Ind	71.76
Texas	Bureau of Economic Geology UT Austin	51.75
Texas	Bureau on Business Research	133.00
Texas	Businessland Inc	6954.27
Texas	C C Scientific Products	1717.61
Texas	Cable & Connector Whse	5801.30
Texas	Campbell Industrial Sales	7170.00
Texas	Canon USA	70842.50
Texas	Career Fair Coordinators Inc	1800.00
Texas	Carey McMahill & Assoc	3189.14
Texas	Caring Medical Supply Co	3366.14
Texas	Carlton Bates Co Inc	10461.00
Texas	Carols Printing Inc	2709.30
Texas	Casters of Dallas Inc	427.00
Texas	CBID	44054.11
Texas	CDI Corporation	7408.52
Texas	Central Construction	188224.95
Texas	Cetech	2925.00
Texas	Chapman Office Prod	320.58
Texas	Chiang Patel & Associates	2000.00
Texas	Chief Pest Control	2000.00
Texas	City of Dallas Buiilding Inspector	179.50
Texas	City of Dallas	3500.00
Texas	Clarke & Courts	141.79
Texas	Class Act Printing	367.20
Texas	Cliff Roe Photography	1564.01
Texas	Cobb and Friend	25000.00
Texas	Colorfast Photos	1879.50
Texas	Commercial Chemcial Prod	159.60
Texas	Commercial Interiors	60450.00
Texas	Compu Supplies & Software	44301.70

STATE	COMPANY	AMOUNT
Texas	Compurite Inc	536431.87
Texas	Computer Ability	121.00
Texas	Computer Controls Inc	70228.18
Texas	Construction Industry	168.84
Texas	Corsicana Welding Supply	1207.24
Texas	Country Valley Sprg Water	280.00
Texas	Cox Office Supply Co	572.39
Texas	Cramar Est/Design Group	15328.27
Texas	Creative Office Systems	58.00
Texas	Crest Protective Services	15127.00
Texas	D Dean Gafford DO Desoto Family Medicine	1410.00
Texas	D I Cole and Associates	98643.00
Texas	Daily Commercial Record	92.00
Texas	DAL MAC Barnes Co	3615.00
Texas	Dallas Business Journal	36.00
Texas	Dallas Digital	100.00
Texas	Dallas Morning News	2226.95
Texas	Dallas Paper & Packaging	2538.05
Texas	Dallas Softstore & PC Inc	4990.00
Texas	Dallas Times Herald	2091.75
Texas	Dallas Typewriter Office	82.93
Texas	Data Business Forms Inc	4334.50
Texas	Datatex Computer Corp	236549.45
Texas	Davis Management Consult	6840.00
Texas	DeSoto Bldg Venture	114697.91
Texas	DeSoto True Value	2274.27
Texas	Diamond Office Supply	788.14
Texas	Diaz-Garcia Enterprises	159.85
Texas	Digital Equipment Corp	3200.00
Texas	Direct Computers	5466.50
Texas	DPF90 Secretariat	6025.00
Texas	DSS Fire Inc	760.10
Texas	Dunbar Assoc/Cabtron Sys	6047.07
Texas	Duncanville Rental Center	11.00
Texas	EDS Technical Products Inc	22106.54
Texas	Educational Equipment Co	1285.00
Texas	Edward Bon Co	692.68
Texas	Eiki International Inc	564.00
Texas	Elder Leasing Co	180978.00
Texas	Electronic Publishing Ser	2000.00
Texas	Electronics Boutique	56.99
Texas	Empire Moving and Storage	99999.99
Texas	Engineering Cibernetics	4004.00
Texas	Ennis Office Supply	1651.79
Texas	Ennis True Value Hardware	894.62
Texas	Entre Computer Center	36700.45
Texas	Evans-U-Rent-It	220.00
Texas	Exchange Tool & Supply	10244.00
Texas	Executive Properties	13171.87
Texas	F&K Hedman Check Pro Co	190.00

STATE	COMPANY	AMOUNT
Texas	F&R Construction Co	450.00
Texas	Fabricating Machinery Inc	5022.25
Texas	Fast Future Systems	141.00
Texas	First Financial Resources	375.00
Texas	Fisk Electric Company	1250.00
Texas	Flooring Services Inc	1302.58
Texas	Foreman Office Products	64478.36
Texas	Fort Knox Protection Inc	65000.00
Texas	Fowler Engineering	6716.62
Texas	Frank Slesthenger Catering	30000.00
Texas	Ft Worth Star Telegram	1347.80
Texas	Genigraphics	5000.00
Texas	Gernsbachers Inc	138786.50
Texas	Gibson Sign Studio	7625.00
Texas	Gilbert International	8665.00
Texas	Ginger House	1736.75
Texas	GPO Bookstore	283.50
Texas	Grid Systems Inc	9671.00
Texas	Griffin Mechanical Inc	8638.17
Texas	GTT Electronics	546.00
Texas	Gulf Publishing Company	49.95
Texas	Hallmark Electronics	5784.25
Texas	HARC	2246839.19
Texas	Hardy Heck Moore Inc	123443.00
Texas	Hart Graphics	673.00
Texas	Heath Zenith	1432916.13
Texas	Hewlett-Packard	378633.14
Texas	Hi-Tech Communications	4680.50
Texas	Highland Superstore Inc	834.98
Texas	Hoover Brothers Inc	17113.38
Texas	Horizon Office Products	25511.61
Texas	Huber Upholstering	170.00
Texas	Hudson Office Products	199531.29
Texas	Hunt Promotions	1284.76
Texas	Imaging Presentations Inc	180.00
Texas	IMSL	37400.00
Texas	Index Computer Inc	16691.23
Texas	Industrial Information Service	12.40
Texas	INMAC	4183.66
Texas	Innovative Design Group	6400.00
Texas	Inotek Corp	175.75
Texas	Instant Photos Inc	517.00
Texas	Interactive Devel Envir	7700.00
Texas	Intergraph Corporation	322867.84
Texas	International Builders	802.50
Texas	IBM	4650.00
Texas	Intex Elect Contractors	2230.77
Texas	Intl Bus Consumables Co	8132.72
Texas	J Westbrook Co	620.00
Texas	J&S Communications	16801.00

STATE	COMPANY	AMOUNT
Texas	Jani-King of Dallas	1200.00
Texas	Jerico Group	1186.25
Texas	Jim Lake Company	48.92
Texas	Jim Thomas Company	3478.71
Texas	John Bird Photography	260.00
Texas	Kahleen Office Supply	1805.84
Texas	Kennedy Welding Supply	3452.89
Texas	Kenric Medical Supply	493.70
Texas	Key Strokes Process Svc	1640.88
Texas	Kilpatrick Equipment Co	2799.42
Texas	Kimball Audio-Video Six Dallas Communications	75330.00
Texas	KMS Const Supply Co Inc	175.00
Texas	Koetter Fire Protection	3052.70
Texas	L. C. Jones Construction Inc	18141.31
Texas	Lancaster Manufacturing	585.00
Texas	Lanier Johnson Inc.	454.00
Texas	Laser Quality Cartridges	1426.30
Texas	Lincoln Lock & Security	82.25
Texas	Lockheed Eng & Sci Co	2244230.00
Texas	Lockheed Missles & Space	9500.00
Texas	Lone Star Gas	50163.27
Texas	Lowe Technologies	2400.00
Texas	MLL Inc	3471.13
Texas	M Tech Systems Inc	161.00
Texas	Mac MBA Seminars	5072.00
Texas	Mackie Printing & Office	114.70
Texas	Magnatron	8949.48
Texas	Majors Scientific Books	1159.81
Texas	Maxwell's Books	1734.95
Texas	MB Office Automation	1200.00
Texas	MCI Telecommunications	40105.00
Texas	McShaw Florist	86.24
Texas	Metallurgical Sply Co Inc	278.50
Texas	Metromedia	2155.00
Texas	Metroplex Interiors	1218.00
Texas	Metrotech	114.00
Texas	Microage Computer Store	65669.95
Texas	Microsolutions	10616.00
Texas	Mid-Cities Auto Leasing	1519.85
Texas	Midwest A&E	4398.50
Texas	Miether Industries	4326.00
Texas	Miller Business Systems	440.03
Texas	Minuteman Press	64.64
Texas	Mistry & Associates Inc	1040.00
Texas	Moss & Moss Interiors	8027.18
Texas	Mr. Micro	383.30
Texas	Multi-Plate Circuits Inc	150.00
Texas	Mupac	335.00
Texas	Nat Inst Standards & Tech	37543.15
Texas	National Cellular Inc	375.00

STATE	COMPANY	AMOUNT
Texas	National Connect-Tronix Inc.	20063.25
Texas	Nationwide Ofc Supplies	1244.71
Texas	NCR Corporation	235.44
Texas	Neighbors B-A Coffee Ser	8000.00
Texas	New Antiques	3827.00
Texas	Next, Inc	1000.00
Texas	Occupational Health Ctr	28.50
Texas	Office Interiors	12782.31
Texas	Olde Tyme Frame Shoppe	277.78
Texas	Omega Laser	49.00
Texas	Optical Data Systems Inc	19110.00
Texas	OMI Cranes & Monorail	47992.00
Texas	Owens Fasteners & Supply	637.93
Texas	Ozarka Drinking Water Co	2000.00
Texas	P&A Office Furn	8728.50
Texas	P&T Manufacturing	74.50
Texas	Pac-Tel	4064.17
Texas	Paine & Wooster Bus Prod	179.94
Texas	People's Appl Sales & Svc	1322.50
Texas	Peripheral Products Inc	2195.00
Texas	Personal Computer Rentals	12503.75
Texas	Personalized Business Svc	1725.00
Texas	Phones Unlimited Inc	6636.80
Texas	Pitney Bowes	403.94
Texas	Plant Works	12817.50
Texas	Pleasant Run Printing	3436.27
Texas	Polx-Wisdom Printing Co	5048.34
Texas	Power-Lift Corporation	59394.00
Texas	Precision Business Mach	195.00
Texas	Preferred Office Products	17276.56
Texas	Production Tool Sales	720.00
Texas	Pronto	1659.12
Texas	Provident Bank DeSoto	30.00
Texas	Przano & Associates	2400.00
Texas	Purvis Bearing Service	1524.04
Texas	Quality Components	185.00
Texas	Quality Solutions Inc	319.70
Texas	Quick Sign	460.00
Texas	Radio Shack	275.73
Texas	Rawlinson Electrical Supply	6675.28
Texas	Record Information System	575.00
Texas	Red Wing Shoes	852.32
Texas	Regional Health Supply	4662.71
Texas	Reli Technical Services	4427.00
Texas	Rent-A-Mac	1640.00
Texas	Resource Electronics Distributors	786.20
Texas	Rhodes Office Products	1500.00
Texas	Ridgeway's	400.27
Texas	Robert Reese & Assoc Inc	2132.00
Texas	Rod-L Electronics	2995.00

STATE	COMPANY	AMOUNT
Texas	Ryan Hartmann Friedel Co	1600.00
Texas	Ryder Truck Rental Inc	13355.28
Texas	Sayso Inc	88.70
Texas	Sears	3369.25
Texas	SER National	3100.00
Texas	Serigraphics	914.88
Texas	Sevadjian & Associates	14680.90
Texas	Simpson Technical Sales	3019.00
Texas	Skyline Displays Dallas	3726.00
Texas	Softmart Partners	3295.45
Texas	Softsource	40787.00
Texas	Software Associates	11675.00
Texas	Software Spectrum	81033.00
Texas	Software Systems Inc.	10269.61
Texas	Southern Methodist Univ	95810.00
Texas	Southwest Art Center Inc	31044.84
Texas	Southwest Business Mach	465.00
Texas	Southwest Industrial SLS	7127.00
Texas	Southwest News Agency for New York Times	750.00
Texas	Southwest Office Systems	1860.00
Texas	Southwest Security Scan	287.00
Texas	Southwestern Bell Telephone	142659.61
Texas	Southwestern Gage Inc	391.00
Texas	Standard Industrial Supply	14326.07
Texas	Stanley Smith Security	40707.00
Texas	Startext	202.64
Texas	State Department of Highways	173.50
Texas	State Porch & svc Com	2.75
Texas	Stor-A-File	2417.76
Texas	Storage & Retrieval Sys	3996.27
Texas	Storage Equipment Co Inc	1110.38
Texas	Sullivan Transfer Co	8709.43
Texas	Summus Computer Systems	16052.00
Texas	Sun Micro Systems	148773.00
Texas	Sun Observer	80.00
Texas	Superior Chaircraft	176970.00
Texas	Supr of Docu U.S. Gov	408.25
Texas	SW Texas State Univ Career Planning & Placement	300.00
Texas	Sybase Inc	415.00
Texas	Tartan Graphics	721.00
Texas	Tech Plan Inc	4232.00
Texas	Technical Concept	65502.00
Texas	Technology & Testing Ass/TX	6000.00
Texas	Techsolutions Inc	20231.86
Texas	Tesco	902.00
Texas	Texas Dept of Pub Safety General Services Bureau	95.70
Texas	Texas Mill Supply Inc	1653.90
Texas	Texas National Research	21000.00
Texas	Texas Paper & Ribbon Co	311.90
Texas	Texas Towers	1271.60

STATE	COMPANY	AMOUNT
Texas	Texas Utilities Elec Co	172000.00
Texas	Texas Water Dev Board Fiscal Services Office	18.83
Texas	The Color Place Inc	280.93
Texas	The Inner Office	6771.76
Texas	The Rush Company	399.85
Texas	The Spencer Co	867.00
Texas	The Tetra Group	98500.00
Texas	The University of Texas At Austin R L Moore Hall	77190.00
Texas	Thomas Reprographics	10250.32
Texas	Threshold	7865.62
Texas	THT Sales Co Inc	32931.30
Texas	Tilford	492.70
Texas	Trammel Crow Co	1852672.70
Texas	TRB Company	3390.50
Texas	TU Electric	10035.94
Texas	Typeworks	31.00
Texas	U-Haul Corporate Moves	485.00
Texas	United Parcel Services	5000.00
Texas	University of North Texas	30.00
Texas	University of Tx/Austin Inst of Fusion Studies	50000.00
Texas	Vallen Safety Supply	120.00
Texas	Vanderburg Drafting Supply	9240.28
Texas	Vision Printing-	3099.11
Texas	VMETRO Inc	8440.00
Texas	W.W. Cannon Company	19299.35
Texas	Wallace Dean Art Studio	10333.00
Texas	Warehouse Properties	3717.00
Texas	Waxahachie Light	367.00
Texas	Welcom Software Tech	44435.20
Texas	Westmoreland Design Group	22500.00
Texas	Westron Communications	5750.00
Texas	WHF Associates	3675.00
Texas	Wilcox Enterprises	28440.00
Texas	Williams Tel Services	36687.36
Texas	Wooster & Berry Bus Prod	18753.68
Texas	Wooster & Berry/Whitaker	1536.47
Texas	Zip Printing	869.75
Utah	University of Utah	500.00
Virginia	CACI Inc - Federal	2050.00
Virginia	Deltek Systems Inc	127589.96
Virginia	Logicon Strategic & Information	23494.00
Virginia	N C M A	72.00
Virginia	National Society of Black Engineers	1700.00
Virginia	NTIS	500.00
Virginia	Omnicom Inc	57.00
Virginia	The U.S. Congress Handbook	8.95
Vermont	American Inst of Physics	602.75
Washington	Aldus Corporation	80.00
Washington	Data I/O Corp	14990.00
Washington	Davis Wright Tremaine	150572.31
Washington	Microsoft Corporation	627.95
Washington	Output Technology Corp	124.50
Washington	Specialized Systems Consultants Inc	34.00
Wisconsin	Amateur Electric Supply	2221.35

STATE	COMPANY	AMOUNT
Wisconsin	American Society for Quality Control	152.35
Wisconsin	Demco Inc	1864.66
Wisconsin	Highsmith Co Inc	528.66
Wisconsin	Lab Safety Supply Inc	237.40

Question: For each state, show, for FY 1990 -- companies expressing interest in SSC contracts.

Answer: I will be pleased to provide this information for the record.

(The information follows:)

The last column labeled CL is the firm's classification code. Listed below explains each classification.

CLASSIFICATION CODES

A	Small
B	Large
C	Disadvantaged
D	Women Owned
E	Labor Surplus
F	Small - Disadvantaged
G	Small - Women Owned
H	Small - Women Owned - Labor Surplus
I	Small - Disadvantaged - Labor Surplus
K	Small - Labor Surplus
L	Small - Disadvantaged - Women Owned - Labor Surplus
M	Large - Disadvantaged
N	Large - Women Owned
O	Large - Labor Surplus
P	Large - Disadvantaged - Women Owned
Q	Large - Disadvantaged - Labor Surplus
R	Large - Women Owned - Labor Surplus
S	Large - Disadvantaged - Women Owned - Labor Surplus

SUMMARY OF FIRMS EXPRESSING INTEREST IN SSCL BUSINESS

STATE	NUMBER OF FIRMS
ALABAMA	7
ALASKA	3
ARIZONA	7
ARKANSAS	4
CALIFORNIA	54
COLORADO	14
CONNECTICUT	10
DELAWARE	1
DISTRICT OF COLUMBIA	1
FLORIDA	15
GEORGIA	14
HAWAII	0
IDAHO	0
ILLINOIS	53
INDIANA	5
IOWA	0
KANSAS	6
KENTUCKY	2
LOUISIANA	45
MAINE	0
MARYLAND	13
MASSACHUSETTS	16
MICHIGAN	11
MINNESOTA	7
MISSISSIPPI	6
MISSOURI	14
MONTANA	0
NEBRASKA	1
NEVADA	1
NEW HAMPSHIRE	2
NEW JERSEY	16
NEW MEXICO	11
NEW YORK	26
NORTH CAROLINA	9
NORTH DAKOTA	1
OHIO	22
OKLAHOMA	214
OREGON	2
PENNSYLVANIA	39
RHODE ISLAND	1
SOUTH CAROLINA	1
SOUTH DAKOTA	0
TENNESSEE	16
TEXAS	2,978
UTAH	0
VERMONT	0
VIRGINIA	14
WASHINGTON	8
WEST VIRGINIA	1
WISCONSIN	8
WYOMING	0
FRANCE	1
CANADA	2

ALABAMA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Alabama Metal Industries	3245 Fayette Ave	Birmingham	AL 35208	B
Colsa, Inc.	6726 Odyssey Drive	Huntsville	AL 35806	F
Integraph Corporation	One Madison Industrial Park	Huntsville	AL 35807	B
Intergraph Corporation	One Madison Park	Huntsville	AL 35804	B
James L. Harrell	216 Gunn Rd/P.O. Box 17776	Montgomery	AL 36117	A
Mayfield Manufacturing Co	PO Box 19397	Birmingham	AL 35219	A
Medical Place	1287 Carter Hill Road	Montogmery	AL 36106-1419	F

ALASKA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Alaska Quality Control and	907 Dowling Rd. Suite 18	Anchorage	AK 99518-1427	A
Garver & Garver	PO Box C-50	Little Rock	AK 72203	B
South Coast Inc	PO Box 8620	Ketchikan	AK 99901	B

ARIZONA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Arizona Chemical	P.O. Box 7765	Phoenix	AZ 85011	F
Charlie Taylor	901 West Watkins Rd	Phoenix	AZ 85007	F
Circle H Industries	322 Naco Hwy	Bisbee	AZ 85603	G
Corella Electric Inc	1000 E Indian School	Phoenix	AZ 85014	F
Ray Rashkin Associates	1930 Alma School Rd Ste D-107	Mesa	AZ 85210	B
Software Marketing	3002 W Camino Alto	Tucson	AZ 85741	I
V A W Of America Inc	PO Box 6726	Phoenix	AZ 85005	B

ARKANSAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Claridge Products & Equip	PO Box 910/601 Hwy 62-65 So	Harrison	AR 72602-0910	A
Installation Technicians,	P.O. Box 1026, Highway 412 East	Siloam Springs	AR 72761	A
Sygnis, Inc.	10825 Financial Parkway Suite 401	Little Rock	AR 72211	A
Trans-America	P.O. Box 4364	Little Rock	AR 72214	F

CALIFORNIA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Aegir Systems, Inc.	555 Airport Wat Suite B	Camarillo	CA 93010	I
Airdrome Parts Company	P.O. Box 1867	Long Beach	CA 90801-1867	A
American Electronics	14325 South Figueroa Street	Gardena	CA 90248	A
American Protective	7770 Pardee Ln	Oakland	CA 94621	B
Avanzar Technologies Inc	PO Box 496	Santa Rosa	CA 95404	G
Beta Development	6780-R Sierra Court	Dublin	CA 94568	M
Bournes, Inc	1200 Columbia Ave.	Riverside	CA 92507	B
Calex Mfg Co Inc	3355 Vincent Rd	Pleasant Hill	CA 94523	A
Cooner Wire Co	9186 Independence Ave	Chatsworth	CA 91311	A
Crest Products	2000 South Susan Street	Santa Ana	CA 92704	I
Decision Planning Corp	3184 A Airway Ave	Costa Mesa	CA 92626	A
Delta Technologies, Inc.	120 East 10th Street	Tracy	CA 95376	F
Dillingham Construction	P.O. Box 1089	Pleasanton	CA 94588	B
Electrorack Products Co	1443 S Sunkist St	Anaheim	CA 92806	I
Fortron/Source	6818-G Patterson Pass Road	Livermore	CA 94550	F
G & C Equip Co	PO Box 5419	Gardena	CA 90249	F
Genisco Technology Corp	14930 E Alondra Blvd	LaMirada	CA 90638-5754	A
GMW Associates	P.O. Box 2576	Redwood City	CA 94063	A
Granite Construction CO	PO Box 900	Watsonville	CA 95077	B
Helionetics, Inc./DECC	17312 Eastman Street	Irvine	CA 92714	A
International Electronic	P.O. Box 7704	Burbank	CA 91510-7704	B
IXYS Corporation	2355 Zanker Rd	San Jose	CA 95131-1109	A
Kube Electronics Inc	3847 Hitch Blvd	Moorpark	CA 93021	F
KYCON Cable &	1772 Little Orchard Street	San Jose	CA 95125	A
Lambert, MacGill, Thomas,	515 Aldo Avenue	Santa Clara	CA 95054	A
Lemo USA	P.O. Box 11488	Santa Rosa	CA 95406	A
LKG-CMC	510 West 6th Street Suite 414	Los Angeles	CA 90014	G
LSI Jennings	970 McLaughlin Ave	San Jose	CA 95122-2696	B
Luxtron	1060 Terra Bella Ave	Mountain View	CA 94043	A
M.C.I. Water Truck Service	P.O. Box 2096	Lakeside	CA 92040	F
March Metalfab, Inc.	2250 Davis Court	Hayward	CA 94545	A
Matra Electric, Inc.	17715 Susana Rd/P.O. Box 5329	Compton	CA 90224	A
O'Brien-Kreitzberg &	15821 Ventura Blvd Suite 625	Encino	CA 91436	B
Office Club, Inc.	1635 Challenge Dr.	Concord	CA 94520	B
Pacific Electric Motor	1009 66th Avenue	Okland	CA 94621	A
Pal Consultants, Inc	1922 The Alameda Suite 101	San Jose	CA 95126	F
Phoenix International	2041 Roscrans Ave.	El Segundo,	CA 90245	F
Phoenix Systems &	990 Lane Avenue Suite 110	Chula Vista	CA 92013	F
Physionix Corporation	520 Santa Carina	Solana Beach	CA 92075	F
R. J. Munns Mfg., Inc.	5885 La. Ribera St. Unit B.	Livermore	CA 94550	A
Republic Fastener	1300 Rancho Conjeo Blvd	Newbury Park	CA 91320	A
Richardson Electronics Ltd	21243 Ventura Blvd	Woodland Hills	CA 91364	A

CALIFORNIA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Rod-L Electronics Inc	923 Hamilton Ave	Menlo Park	CA 94025	A
Ruan Bearing Company	4525 West Jefferson Blvd	Los Angeles	CA 90016	B
SI-TAC Connectors, Inc.	638 So. State College Blvd	Fullerton	CA 92631	B
Stantron Unit of Zero	6900 Beck Avenue	North	CA 91605	B
Terranova Scientific Inc	5841 Bell Rd	Auburn	CA 95603	A
The Pittston Co	18200 Von Karman	Irvine	CA 92715	B
Umpco Incorporated	7100 Lampson Ave P.O. Box 5158	Garden Grove	CA 92645-5158	A
Valley-Todeco	12975 Bradley Company	Sylmar	CA 91342	B
Vanir Construction	555 Capitol Mall Suite 350	Sacramento	CA 95814	B
Varian Microwave	3200 Patricl Henry Drive	Santa Clara	CA 95054	B

CANADIAN
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	PROVIDENCES & ZIP	C
Giuseppe Torno	#500-40 Holly Street	Toronto	ON Canada M4S 2C3	B
Howden Canada (Div. of	1510 Birchmont Rd	Scarborough	ON Canada M1P 2G6	B

COLORADO
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Buehler Mayflower	3899 Jackson St	Denver	CO 80205	A
Cryenco Inc	5995 North Washington St	Denver	CO 80216	A
Cryogenic Technical	3445 Penrose Pl Suite 230	Boulder	CO 80301	A
E N Murray Inc	707 Umatilla St	Denver	CO 80204	A
Guaranty Press, Inc.	707 17th Street Suite 2900	Denver	CO 80202	F
Guaranty Press Inc	707 17th St Ste 2900	Denver	CO 80207	F
Integrated Support	2525 Arapahoe Ave Building E4 Suite	Boulder	CO 80302	A
JPO Equipment Co	3231 S Platte River Dr	Englewood	CO 80110	G
Kaman Instrumentation	PO Box 7463	Colorado	CO 80933-7463	B
Meiwan Ennginееring	330 Seminole Dr	Boulder	CO 80303	F
Picture This Video	5 South Colorado Blvd	Denver	CO 80222	F
RMES Communications	3003 Arapahoe St Suite 106	Denver	CO 80205	C
RMES Communications	3003 Arapahoe Street Suite 106	Denver	CO 80205	C
Tools For Bending, Inc.	194 West Dakota Ave	Denver	CO 80223	A

CONNECTICUT
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Alcad Inc	73 Defco Park Rd	North Haven	CT 06437	B
AMDATA, Inc. (A	1000 Day Hill Road	Windsor	CT 06095	B
Amphenol/Spectra-Strip	720 Sherman Ave	Hamden	CT 06514	B
Connecticut Fineblanking	70 Hawley Avenue	Bridgeport	CT 06606	A
Elan Technical	35 Kings Highway East	Fairfield	CT 06430	G
Globe Security Systems	561 W Main St	Norwich	CT 06360	B
James Howden America,	23 Old Windsor Rd	Bloomfield	CT 06002	B
Structured Computer	302 West Main Street	Avon	CT 06001	A
Tara Metals, Inc.	227 Progress Drive	Manchester	CT 06040	A
Times Microwave System	358 Hall Ave	Wallingford	CT 06492	B

DELAWARE
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
DuPont Company	P.O. Box 6099 - Bellevue Bldg	Newark	DE 19714-6099	B

DISTRICT OF COLUMBIA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Marriott Corporation	Marriott Drive	Washington	DC 20058	B

ILLINOIS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Ability Engineering	16140 Vincennes Ave.	South Holland	IL 60473	A
Advance Graphics	799 Roosevelt Rd Bldg 6-310	Glen Ellyn	IL 60137	A
Advanced Video	49 S Washington St	Hinsdale	IL 60521	G
American Emergency	Po Box 215	Wheaton	IL 60189	A
Andrew Corporation	10500 W 153rd St	Orland Park	IL 60462	B
Arcor Electronics Co Inc	1821 Elmdale Dr	Glenview	IL 60025	A
Broadway Appliance &	16 North Broadway	Aurora	IL 60505	A
C & C Technology Inc	Bldg 9 Unit 60 245 W Roosevelt Rd	West Chicago	IL 60185	G
Carney & Company Inc	636 Schneider Dr	South Elgin	IL 60177	A
Carol Metal Products	349 Getchell	Grayslake	IL 60030	I
Caster Corporation	4460 N Elston Ave	Chicago	IL 60630	A
Charles Industries	4902 Tollview Dr	Rolling Meadow	IL 60008	B
Computer Discount	2840 Maria Ave	Northbrook	IL 60062	A
Comtrol Corporation	4746 Main St	Lisle	IL 60532	A
D & H Excavating Inc	1026 Bangs St	Aurora	IL 60505	A
Earl Genn & Associates,	838 S. Arthur Ave	Arlington	IL 60005	A
Efengee Electrical Supply	31W 356 Diehl Rd	Naperville	IL 50563	B
Electro Wire Inc	3400 N Kedzie Ave	Chicago	IL 60618	F
Electro-Metal Products	8019-55 N Monticello Ave	Skokie	IL 60076	A
Equipto	225 S Highland	Aurora	IL 60506	A
Frey Tool & Engineering	7912 West Grand Avenue	Elmwood Park	IL 60635	A
Hemani	944 Harlem Ave	Glenview	IL 60025	F
Hi-Tech Manufacturing Inc	8220 N Christiana	Skokie	IL 60076	A
Illinois Computer Cable	1404 Sherman Rd	Lemont	IL 60439	A
Indel Electrical Distributors	1850 S 43rd St	Chicago	IL 60609	F
Inland Steel Company	30 West Monoe St	Chicago	IL 60603	B
Innovative Computer	925 Penny Lane Ste B	Schaumburg	IL 60173	A
John Mathes & Associates	210 W Sand Bank Rd	Columbia	IL 62236	B
Johnson Service Group,	475 Frontage Rd Suite 103	Burr Ridge	IL 60521	B
Kenny Construction Co	250 Northgate Parkway	Wheeling	IL 60090	B
Landis & Gyr Powers Inc	1000 Deerfield Pkwy	Buffalo Grove	IL 60089	B
Lex Computer Systems	555 Pierce Place Ste 295	Itasca	IL 60143	B
Mar-Fre Manufacturing Co	2541 Dukane Dr	St Charles	IL 60174	A
Medcor Inc	6206 Lou Ave	Crystal Lake	IL 60014	A
Meyer Tool &	9221 South Kilpatrick Ave	Oak Lawn	IL 60453	G
Meyer Tool &	9221 South Kilpatrick Ave	Oak Lawn	IL 60453	G
Penco Precision	PO Box 8105	Northfield	IL 60093	A
Phone-Ducs, Inc.	4415 W. Harrison	Hillside	IL 60162	A
Planfield Stamping -	1351 N Division St Rt 59	Planfield	IL 60544	B
Pollak and Skan Inc	120 W Center Court	Schaumburg	IL 60195	B
Prinzing Enterprises	P.O. Box 468	Warrenville	IL 60555	A
Quill Corporation	PO Box 4700	Lincolnshire	IL 60197-4700	B

ILLINOIS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Rockford Drop Forge Co	2031 9th St	Rockford	IL 61104	A
S Himmelstein & Co	2490 Pembroke Ave	Hoffman Estates	IL 60195	A
Skolnik Industries Inc	4900 S Kilboum Ave	Chicago	IL 60632	A
St Charles Manufacturing	1611 E Main St	St Charles	IL 60174	B
T. Edward Black	1127 Miller Lane	Buffalo Grove	IL 60089-4244	A
T J Lambrecht	Rt 30 & Gougar Rd	Joliet	IL 60432	A
Taracorp Industries Inc	16th & Cleveland Blvd	Granite City	IL 62040	A
Techno-Mex Metal	960 Sivert Dr Unit 1	Wood Dale	IL 60191	A
Triton Industries/Bell &	4259 South Western Blvd	Chicago	IL 60609	A
Universal Technical	1220 Rock Street	Rockford	IL 61101	F
W S Darley & Sons	2000 Anson Dr	Melrose Park	IL 60160	A

INDIANA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Chemtrol Div Of Nibco	5250 W 76th St	Indianapolis	IN 46268	B
Frontier-Kemp	1695 Allen Rd/PO Box 6548	Evansville	IN 47719-0548	B
Indiana Brass, Inc.	P.O. Box 15009	Fort Wayne	IN 46885-5009	A
Petron International, Inc.	P.O. Box 15009	Fort Wayne	IN 46885-5009	F
Traylor Bros Inc	835 North Congress Ave	Evansville	IN 47715	B

KANSAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Airtechnics, Inc.	P.O. Box 3466	Wichita	KS 67201	A
Beaver Drill & Tool	3995 Mission Rd	Kansas City	KS 66103	A
DCI, Inc.	P.O. Box 215	Olathe	KS 66061-0215	A
Martin K Eby Construction	610 N Main	Wichita	KS 67203	B
Optimized Process	P.O. Box 706	Chanute	KS 66720	A
Thomas Transfer &	906 East 6th Street	Emporia	KS 66801	A

KENTUCKY
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Huntington Testing &	13045 Middletown Industrial Blvd	Middletown	KY 40223	A
S N S Welding & Service	PO Box 43896	Louisville	KY 40243	G

LOUISIANA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
ABMB Engineers Inc	2237 S Acadian Thruway Suite 601	Baton Rouge	LA 70808	F
Aillet Fenner Jolly &	1055 LA Ave	Shreveport	LA 71101	A
Aillet Fenner Jolly &	1055 Louisiana Ave	Shreveport	LA 71101	A
Atlantic Electrical	7606 Westbank Expressway	Marrero	LA 70072	F
Atlantic Electrical	7606 Westbank Expressway	Marrero	LA 70072	F
Baron Consulting	127 Richland	Mandeville	LA 70448	G
Bayou State Security	501 Basin Street	New Orleans	LA 70112	F
Billes/Manning Architects	839 St. Charles Ave Suite 300	New Orleans	LA 70130	F
Billes/Manning Architects	839 St. Charles Ave Suite 300	New Orleans	LA 70130	F
Boxco, Inc	8650 Box Road	Shreveport	LA 71106-6414	A
C.O.E. Enterprises of La.,	P.O. Box 566	Pearl River	LA 70452	G
Center Group, Inc.	822 Perdido Street Suite 401	New Orleans	LA 70112	F
Clovis Hendry Industries,	P.O. Box 70	Addis	LA 70710-0070	A
Con-Fab Engineering &	6309 Linwood Ave	Shreveport	LA 71106-2615	A
Cooling Tower	Rt 1 Box 1120 Clark Rd	Whitecastle	LA 70788	B
D.P. Willis Construction	570 Rex Beard Rd	Haughton	LA 71037	A
Engineered Mechanical	PO Box 15084	Baton Rouge	LA 70895	A
Firth Construction	6350 One Calais	Baton Rouge	LA 70809	F
Franks's Welding &	PO Box 4	Taylor	LA 71080	A
Frees Inc	2531 Samford Ave	Shreveport	LA 71133	A
Gulf South Machine, Inc.	P.O. Box 268	Ponchatoula	LA 70454	A
Integrated Technical	2865 Mason Street	Baton Rouge	LA 70805	A
International Tours of	3435 W. 70th Street	Shreveport	LA 71108	A
John E Chance &	PO Box 52029	LaFayette	LA 70506-2029	B
Laserphile Management	4606 Monkhouse Dr	Shreveport	LA 71109	G
Management & Technical	P.O. Box 169	Luling	LA 70070	F
Management & Technical	P.O. Box 169	Luling	LA 70070	F
MGG Pipe & Supply	228 St. Charles Ave Suite 1136	New Orleans	LA 70130	I
Morphy, Makofsky,	336 North Jefferson Davis Parkway	New Orleans	LA 70119	A
Nix Sheet Metal, Inc.	3217 Forge Rd.	Shreveport	LA 71109	A
Northeast X-ray Services,	113 Royal Street	West Monroe	LA 71291	A
NTB, Inc.	848 Texas Avenue	Shreveport	LA 71101	F
Precision Industries Inc	PO Box 46435	Baton Rouge	LA 70895	A
R & H Dozer Service	Po Box 296	Roseland	LA 70456	A
R.P.B. Ltd.	201 35th Street	Marion	LA 72402	A
R & S Services Company	918 Hatchell Lane	Denham	LA 70726-2621	F
Roy O Elder Lumber Co	PO Box 550	Opelousas	LA 70571	A
Southern Structures Inc	PO Box 52005	Lafayette	LA 70505-2005	A
Spectrum USA, Inc.	P.O. Box 10603	New Orleans	LA 70181	F
Sprawls Engineering	PO Box 37982	Shreveport	LA 71133	A
St. Pierre Fabrication &	P.O. Box 639	Desirehan	LA 70047	A
Texas Southern Builders	PO Box 1815	Shreveport	LA 71166	A

LOUISIANA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
The Abacus Group,	4241 Veterans Blvd	Metairie	LA 70006	I
The Holden-Trahan Group	7916 Wrenwood Blvd Suite A	Baton Rouge	LA 70809	A
Worldwide Inspection	P.O. Box 311	Amelia	LA 70340	A

MARYLAND
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
ASTA Engineering, Inc.	8401 Corporate Drive Suite 130	Landover	MD 20785	F
Chas G Stott & Co Inc	9301 Largo Dr West	Landover	MD 20785	B
E I L Instruments Inc	10 Loveton Circle	Sparks	MD 21152	A
Eastport International	501 Prince Georges Blvd	Upper Marlboro	MD 20772	A
Global Technology	11141 Georgia Ave Ste A-24	Silver Spring	MD 20902	F
Leasametric, Inc.	P.O. Box 20884	Gaithersburg	MD 20884	B
Motorola, Inc.	1701 McCormick Drive	Landover	MD 20785	B
Optim Electronics	12401 Middlebrook Dr	Germantown	MD 20874	B
Philtec, Inc.	P.O. Box 359	Arnold	MD 21012	A
Photo Science, Inc.	7840 Airpark Rd	Gaithersburg	MD 20879	A
Pruitt Energy Sources Inc	6715 Kenilworth Ave Suite A1	Riverdale	MD 20737	F
Scientech, Inc.	11821 Parklawn Drive	Rockville	MD 20852	A
Texcom Inc	4200 Forbes Blvd	Lanham	MD 20706	F

MASSACHUSETTS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Alberox Corporation	Industrial Park	New Bedford	MA 02745	B
Associated Environmental	10 Industrial Way	Amersbury	MA 01913	A
CSD Sealing Systems	27 Upham St	Melrose	MA 02176	A
Edwards High Vacuum,	301 Ballardvale Street	Wilmington	MA 01887	B
Hewlett Packard Company	Apollo Direct Channel/CHA-o1-IA	Chelmsford	MA 01824	B
Howden Sirocco Inc	One Westinghouse Plaza	Hydr Park	MA 02136	B
John Dunnicliff	8 Adams Street	Lexington	MA 02173	A
Koch Process Systems Inc	20 Walkup Drive	Westboro	MA 01581	B
Kronos Incorporated	62 Fourth Ave	Waltham	MA 02154	B
Merida Trading Group Inc	4-C Gill St	Woburn	MA 01801	A
National Fire & Medical	20 Perry Ave	Buzzards Bay	MA 02532	A
Plastic Systems Inc	50 Brigham St	Marlboro	MA 01752	A
Soil And Rock	320 Neeham St	Newton Upper	MA 02164	B
Technical Aid Corporation	109 Oak St	Newton Upper	MA 02164	B
The First Electronic Corp	71 Von Hillern St	Boston	MA 02125	A
Vat Incorporated	600 West Cummings Park	Woburn	MA 01801	A

MICHIGAN
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C:
Airport Airways	20468 Washburn Street	Detroit	MI 48221-1024	F
Airport Airways	20468 Washburn Street	Detroit	MI 48221-1024	F
Demmer Corporation	3525 Capital City Blvd	Lansing	MI 48901	A
Demmer Corporation	3525 Capital City Blvd.	Lansing	MI 48906	A
JWI Inc	2155 112th Ave	Holland	MI 49424	A
Landscape Forms Inc	431 Lawndale Ave	Vicksburg	MI 49097	A
Leco Corporation	3000 Lakeview Ave	St Joseph	MI 49085	N
Terryberry Company	2033 Oak Industrial Dr	Grand Rapids	MI 49505	A
Veritechnology Electronics	Hilltop Road	St. Joseph	MI 49085	B
Weldun International	9850 Red Arrow Hwy	Bridgman	MI 49106	B
Wholesale Tool Co Inc	12155 Stephens Dr	Warren	MI 48090	A

MINNESOTA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Air Quality Engineering Inc	3340 Winpark Dr	Minneapolis	MN 55427-2083	A
Civil Structures, Inc.	4725 Dow Rd	Saginaw	MN 55779	A
CNA Consutling	2800 University Ave SE	Minneapolis	MN 55414	G
Itasca Consulting Group,	1313 Fifth Street SE Suite 210	Minneapolis	MN 55414	A
Remmele Engineering Inc	1211 Pierce Butler Route	St Paul	MN 55104	A
Robinson Rubber Products	4600 Quebec Ave N	Minneapolis	MN 55428	A
Scorpio Tool & Die Inc	8670 Monticello Ln	Maple Grove	MN 55369	A

MISSISSIPPI
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Carothers Construction,	P.O. Box 687	Water Valley	MS 38965	B
Chris-Craft Enterprises inc	PO Box 0	Morton	MS 39117	F
Chris-Craft Enterprises,	P.O. Box O	Morton	MS 39117	F
Commtech, Inc.	P.O. Box 97	Brookhaven	MS 39601	B
CSY, Inc.	401 East Capitol Street Suite 400	Jackson	MS 39201	F
Richlen Industrial Express	P.0. Box 4334	Laurel	MS 39441-4334	A

MISSOURI
FIRMS INTERESTED IN SSCL BUSINESS

OMPANY	ADDRESS	CITY	STATE & ZIP	C
runson Instrument Co	8000 E 23rd St / PO Box 7951	Kansas City	MO 64129	A
arter-Waters Corporation	2440 W. Pennway	Kansas City	MO 64141	B
lectronics & Space	8100 West Florissant Ave	St. Louis	MO 63136-1417	B
errellgas	One Liberty Plaza	Liberty	MO 64058	B
ixtures Furniture	1642 Crystal	Kansas City	MO 64126	A
PS Construction, Inc.	1627 Main Street, Suite 550	Kansas City	MO 64108	F
PS Construction, Inc.	1627 Main Street Suite 550	Kansas City	MO 64108	F
roup One Architects, Inc.	4049 Pennsylvania #400	Kansas City	MO 64111	F
armon Electronics, Inc.	515 N. Main	Warrensburg	MO 64093	B
ndeeco	425 Hanley Industrial Court	St. Louis	MO 63144	A
aul Mueller Company	P.O. Box 27-48	Kansas City	MO 64180	B
he Sure Sharp Shop	Box 111 Route 2	Noel	MO 64854	A
ri-State Motor Transit	P.O. Box 113	Joplin	MO 64802	B
S Hispanic Chamber of	4900 Main Ste 700	Kansas City	MO 64112	F

NEBRASKA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
George Risk Industries Inc	GRI Plaza	Kimball	NE 69145	A

NEVADA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Diverse Termination	1744 Forrest Way	Carson City	NV 89706	A

NEW HAMPSHIRE
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Balzers	8 Sagamore Park Rd	Hudson	NH 03051	B
Incon, Inc.	85 Northeastern Blvd	Nashua	NH 03062	A

NEW JERSEY
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
A I Technology Inc	PO Box 3081	Princeton	NJ 08543	F
Airco Gases	575 Mountain Ave	Murray Hill	NJ 07974	B
Boonton Electronics	791 Route 10	Randolph	NJ 07869	A
Computer Power Inc	124 West Main St	High Bridge	NJ 08829	A
DGM & S	1025 Briggs Rd Suite 100	Mt Laurel	NJ 08054	A
Dumont/E & R Electronics,	26 Fairfield Place	West Caldwell	NJ 07006	A
G & J Steel & Tubing Inc	399 Roycefield Rd	Somerville	NJ 08876	A
Highbeam Business	280 South Harrison Street	East Orange	NJ 07018	A
Laminaire Corp	1572 Hart St	Rahway	NJ 07065	F
Mergentime Corporation	P.O. Box 662	Flemington	NJ 08822	B
Moldieco Plastic Products,	1000 King George's Road	Fords	NJ 08863	F
Rubina Electrical	7221 Kennedy Blvd/P.O. Box 5107	North Bergen	NJ 07047	F
Schaevitz Engineering	7905 N Rt 130	Pennsauken	NJ 08110	B
Tecknit, Inc.	129 Dermody Street	Cranford	NJ 07016	B
Wild Leitz USA, Inc.	24 Link Drive	Rockleigh	NJ 07647	B
Wire-Pro Inc	23 Front St	Salem	NJ 08079	A

NEW MEXICO
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
A.T. Trujillo, Inc.	411 Wyoming Blvd NE	Albuquerque	NM 87123	F
Bradlin Manufacturing Inc	3817 Academy Pkwy So NE	Albuquerque	NM 87109	F
Gardner Zemke Company	4600 Lincoln Rd NE	Albuquerque	NM 87109	B
Koogle & Pouls	8338A Comanche NE	Albuquerque	NM 87110	A
L & M Technologies Inc	4209 Ballon Park Rd NE	Albuquerque	NM 87109	F
McBride Micro Source	P.O. Box 94090	Albuquerque	NM 87119	I
Mevatec Corporation	PO Box 517	Las Cruces	NM 88004	I
MEVATECH Corporation	P.O. Box 516	Las Cruces	NM 88004	I
RE/SPEC Inc.	4775 Indian School Road, N.E. Suite	Albuquerque	NM 87110	A
Techrepco Inc	PO Box 15608	Rio Rancho	NM 87174	G

NEW YORK
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Avins Industrial Products	30 Bay St	Staten Island	NY 10301	A
Burgess-Manning Inc	227 Thorn Ave	Orchard Park	NY 14127	A
Carpenter Mfg Co	PO Box 188	Manlius	NY 13104	A
Ceramaseal Inc	PO Box 2600	New Labanon	NY 12126	B
Computer Conversions	6 Dunton Court	East Northport	NY 11731	A
Computer Conversions	6 Dunton Court	East Northport	NY 11731	A
Coopers & Lybrand	1251 Avenue of the Americas	New York	NY 10020	B
Corron & Black Corp	Wall St Plaza	New York	NY 10005	B
David J. Burgos &	150 Broad Hollow Road Suite 302	Melville	NY 11747	I
DKI Engineering USA,	Nine Turnberry Lane	Clifton Park	NY 12065	F
DKI Group Engineers Inc	Nine Turnberry Lane	Clifton Park	NY 12065	F
DKI/Geoconsult	Nine Turnberry Lane	Clifton Park	NY 12065	F
Kepco, Inc.	131-38 Sanford Ave.	Flushing	NY 11352	A
L G Schafran & Partners	640 5th Ave Floor 17	New York	NY 10019	A
Larsen Engineers	700 West Metro Park	Rochester	NY 14623	A
Microtran Co Inc	145 E Mineola	Valley Stream	NY 11582-0236	A
PCK Technology Division	322 S Service Rd	Melville	NY 11747	B
Philipp Brothers Inc	1221 Ave of the Americas	New York	NY 10020	B
Presray Corporation	159 Charles Colman Blvd	Pawling	NY 12564	A
Quality Technical	71 Executive Blvd	Farmingdale	NY 11735	A
Robbins Container Corp	222 Conover St	Brooklyn	NY 11231	A
Sequentail Information	249 N Saw Mill River Rd	Elmsford	NY 10523	A
Spaulding Composites Co	310 Wheeler St	Tonawanda	NY 14151-5101	B
Tek-Wave Inc	55 Charles Lindbergh Blvd	Mitchel Field	NY 11553	B
The Hoysala Corporation	Nine Turnberry Lane	Clifton Park	NY 12065	F
VMS Consulting	255 Hewlett Neck Rd	Woodmere	NY 11598	A

NORTH CAROLINA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Construction Control	115 West Main Street	Durham	NC 27702	F
Contruction Control	PO Box 1808	Durham	NC 27702-1808	F
Flakt, Inc. Bahnson	500 Shepherd Street	Winston-Salem	NC 27103-1600	A
J.A. Jones Construction	6060 St. Albans Street	Charlotte	NC 28287	B
LifeJack Inc '	820 Salisbury Rd	Statesville	NC 28677	A
N.B.C. Truck, Inc.	P.O. Box 1292	Kenly	NC 27542	F
Southern Optical	P.O. Box 21328	Greensboro	NC 27420	A

NORTH DAKOTA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Maintenance Engineering	3001 University Dr So	Fargo	ND 58103-6001	B

OHIO
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Advance Power Supplies	32111 Aurora Rd	Solon	OH 44139	A
American Augers	PO Box 460	Wooster	OH 44691	A
Boretec Inc	29100 Hall St/ PO Box 39306	Solon	OH 44139	A
Bowman Distribution	850 E 72nd St	Cleveland	OH 44103	B
Cleveland M[illegible]ne	7550 HUB Parkway	Cleveland	OH 44125	A
Computerized Industrial	1445 Summit St	Columbus	OH 43201	F
Connex Pipe Systems, Inc.	1115 Gilman Street	Marietta	OH 45750	B
Consolidated Plastics Co	1864 Enterprise Parkway	Twinsburg	OH 44087	A
D Johnson Enterprises	549 S Spring Rd	Westerville	OH 43081	F
ELANO Corporation	2455 Dayton-Xenia Road	Xenia	OH 45385	B
Enerfab Inc	4955 Spring Grove Ave	Cincinnati	OH 45232	B
General Battery	12690 Elmwood Ave	Cleveland	OH 44111	B
Karbate Vicarb, Inc.	21945 Drake Road	Strongsville	OH 44136	B
LTV Steel Corporation	LTV Steel Bldg Rm 1600-L/25	Cleveland	OH 44115	B
Matco Tools	4403 Allen Road	Stow	OH 44224	B
Premium Travel Services	312 Plum St Ste 920	Cincinnati	OH 45202	B
Pruitt Energy Sources Inc	8015 Euclid Ave	Cleveland	OH 44103-4228	F
Tanks Corporation	One Lewis Square/PO Box 10025	Toledo	OH 43699-0025	B
The Fullwell Motor	14700 Industrial Parkway	Cleveland	OH 44135-0904	G
The Nippert Company	801 Pittsburgh Dr	Delaware	OH 43015	B
Trelleborg/Viking Inc	30700 Solon Industrial Parkway	Solon	OH 44139	B
Victoreen, Inc.	6000 Cochran Road	Cleveland	OH 44110	A

OKLAHOMA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Abnee Industries, Inc.	1500 Lexington Street/Building 501,	Norman	OK 73069-8456	I
Advanced Research &	2278 Industrial Blvd., Ste. 105	Norman	OK 73069	F
Advanced Systems	511 "A" Ave	Lawton	OK 73501	A
Adventure Worldwide	P.O. Box 889	Lawton	OK 73502	A
-ael-Advanced Graphic	9717 East 42nd Street, Suite 100	Tulsa	OK 74146	A
Aerial Data Service, Inc.	10822 East Newton Place	Tulsa	OK 74116	G
All American Contractors,	4239 S. 74th E. Avenue	Tulsa	OK 74145	F
Alliance Steel, Inc.	8600 W. Reno	Oklahoma City	OK 73127	B
Allied Transportation	2216 South Sixth Street	Lawton	OK 73501	F
Allstate Sheet Metal, Inc.	8605 Gateway Terrace	Oklahoma City	OK 73149	F
Alpha Investment Casting	2441 East Independence	Tulsa	OK 74110	F
AM-RAIL Construction, Inc.	P.O. Box 581164	Tulsa	OK 74158	F
American Environmental	5408 E. 11th St., Ste. B	Tulsa	OK 74112-4302	A
American Indian Aviation,	P.O. Box 996	Purcell, McLain	OK 73080	F
Applied Geoscience	1015 Waterwood Parkway-G	Edmond	OK 73034-5324	A
Architectural Sign &	1021 Garden Grove	Yukon	OK 73099	A
ASAP Electric	3127 Silver Oak Dr	Ada	OK 74820-3003	G
Auro Components Inc.	1304 S.E. Grand Blvd	Oklahoma City	OK 73129	A
Automatic Fire Protection	400 N Walnut	Broken Arrow	OK 74012	A
B-E-W Construction	P.O. Box 667	Woodward	OK 73802	A
Banner Construction	Box 850367	Yukon	OK 73085-0367	G
Belle Associates, Inc.	11908 Camelot Drive	Oklahoma City	OK 73120	F
Best Pressure	P.O. Box 82065	Oklahoma City	OK 73148	F
Bethlehem Supply	P.O. Box 2171	Tulsa	OK 74102	M
Brown & Taylor Plumbing	5719 N.W. 40	Oklahoma City	OK 73122-3205	F
Brox Industries Inc	PO Box 1646	Lawton	OK 73502-1646	A
Bruce Luttrell	5502 West 8th	Stillwater	OK 74074	F
Bryan Agri-Products, Inc.	210 N. Kathy	Durant	OK 74701	G
Buckskin Construction Co	Rt 1 Box 46	Wilburton	OK 74578	F
C. H. Guernsey &	3555 Northwest 58th Street	Oklahoma City	OK 73112-4778	A
C.P. Construction, Inc.	3028 Idaho	Chickasha	OK 73018	F
C W Moore	Rt 2	Konawe	OK 74849	A
C Watts Construction Co	1305 S Rockwell	Oklahoma City	OK 73128	A
Capitol Hill Typewriter	4301 S. Penn. Ave	Oklahoma City	OK 73119	I
Carroll Automotive	605 W Missouri / PO Box 406	Walters	OK 73572-0505	A
Caston Door & Plywood	P.O. Box 18856	Oklahoma City	OK 73154	G
Central Plastics Company	P.O. box 3129	Shawnee	OK 74802-3129	A
Chase TV & Appliance,	604 Main	Woodward	OK 73801	F
Cherokee Excavations,	4950 S.W. Horizon	Claremore	OK 74017	F
Cherokee Gardens	P.O. Box 520	Tahlequah	OK 74464	A
Cobbs Engineering, Inc.	5350 East 46 Street, Ste. 200	Tulsa	OK 74135	A
Computer Controls of	P.O. Box 590	Oklahoma City	OK 73107	F

OKLAHOMA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Construction Technology	9400 N. Broadway Suite 530	Oklahoma City	OK 73114	F
Control Devices	2009 West Detroit	Broken Arrow	OK 74012	A
Crystal Clean Enterprises	3901 Valley Park Drive Suite 102	El Reno	OK 73036	A
D & B Construction	P.O. Box 170	Chelsea	OK 74016	A
D.C. Bass & Sons	P.O. Box 1069	Enid	OK 73702-1069	A
D & P Enterprises	5530 East 32nd Place	Tulsa	OK 74135	I
Dan Hill & Associates, Inc.	P.O. Box 720660	Norman	OK 73070-4500	A
Data Protection Services,	10810 East 45th #400	Tulsa	OK 74146	A
Datacom Sciences, Inc.	3232 Raintree Rd	Oklahoma City	OK 73120	F
Datacom &	2735 E. Latimer	Tulsa	OK 74110-5008	I
David's Janitorial Service	910 S W "E" Ave	Lawton	OK 73501	F
Decorative Arts, Inc.	6701 North Bryant	Oklahoma City	OK 73121	A
Defense Technologies,	3212 East I-240	Oklahoma City	OK 73135	A
Delco Construction, Inc.	7845 N. Robinson Suite H2	Oklahoma City	OK 73116	A
Department of Biomedical	6161 South Yale Ave	Tulsa	OK 74136	A
Design Support Services	PO Box 248	Cameron	OK 74932	G
Diepenbrock Construction,	225 S. Broadway	Edmond	OK 73034	A
Don Ellsworth Electric, Inc.	4425 North 81 HWY	Duncan	OK 73533	A
Double Team Horticultural	P.O. Box 247	Porum	OK 74455	A
Eagle Enterprises	402 West Vanoament	Yukon	OK 73099	G
Eagle Systems nd	P.O. Box 207	Lawton	OK 73502	G
Ehmer Anderson	Route 5 Box 193	Guthrie	OK 73044	F
Electratech, Inc.	P.O. Box 76237	Oklahoma City	OK 73147	F
Ellis Company Building &	Box 769	Shattuck	OK 73858	A
Fabco Steel Corp	6710 S Eastern	Oklahoma	OK 73149-5217	A
Facet Quantek, Inc.	P.O. Box 50096	Tulsa	OK 74150-0096	B
FHC, Inc.	4111 South Darlington Suite 400	Tulsa	OK 74135	A
FKW, Inc.	900 N.W. 63rd Street	Oklahoma City	OK 73116	F
Fred Jones Ford of	200 W. Reno	Oklahoma City	OK 73109	G
G.W. Starr Construction,	4239 S. 74th E. Ave	Tulsa	OK 74145	F
Gary A. Crain, Inc.	Rt. 2, Box 143-1	Prague	OK 74864	F
Gray Feather, Inc.	P.O. Box 20486	Oklahoma City	OK 73156-0486	F
Green Country	P.O. Box 429	Sallisaw	OK 74955	F
Green Country	H.C.R. 68, Box 1000	Vian	OK 74962	F
H.C.W. Environmental, Inc.	P.O. Box 1954	Fort Gibson	OK 74434	F
Hamel Medical	P.O. Box 696	Bethanu	OK 73008	A
Hardin's Restaurant	909 South Lakewood	Tulsa	OK 74112	F
Harkins Brothers, Inc.	4207 South Prospect	Oklahoma City	OK 73129	F
Harrison Bolt & Gasket	PO Box 580938, 6130 E. 13th St	Tulsa	OK 74112	A
Hayne Company	P.O. Box 9246/2442 West Skelly	Tulsa	OK 74157-0246	I
Hebco, Inc.	1601 S.E. 66th Street	Oklahoma City	OK 73149-5235	A
HEI, Inc.	P.O. Box 2179	Ardmore	OK 73402-2179	F

OKLAHOMA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Hem Inc	PO Box 1148	Pryor	OK 74362	A
Huddleston Land	P.O. Box 1897	Broken Arrow	OK 74013	F
Hydraulic Specialists, Inc.	12100 North Santa Fe	Oklahoma City	OK 73114-8103	A
Indian Nations, Inc.	P.O. Box 20486	Oklahoma City	OK 73156-0486	F
Industrial Gasket Inc.	8100 S.W. 15th Street	Oklahoma City	OK 73128	A
Industrial Specialties, Inc.	1603 SE 25	Oklahoma City	OK 73129	A
Innovative Technology	P.O. Box 726	Elk City	OK 73648	A
Insulation Specilaties, Inc.	P.O. Box 949	Ponca City	OK 74602	A
Int'l Auto Parts, Inc.	5316 So. Penn	Oklahoma City	OK 73119	G
JB Electronics, Inc.	P.O. Box 1052	El Reno	OK 73036	A
Jim Sellers Construction	P.O. Box 1719	Sapulpa	OK 74067	F
Johnstons Supply of	P.O. Box 82129	Oklahoma City	OK 73148-0129	A
KCA Apparel Group	1401 Lawrie Tatum Rd	Lawton	OK 73502	F
Kenjuan Corporation	1714 South Boston	Tulsa	OK 74119	F
King-Lindsey, Inc.	P.O. Box 400, 505 East Main	Cordell	OK 73632	A
L B & M Associates, Inc.	211 SW "A" Avenue	Lawton	OK 73501	F
Lance Systems, Inc.	P.O. Box 336	Wilson	OK 73463	F
Landis Steel Ltd.	116 W. A Street, P.O. Box 248	Picher	OK 74360	A
Laster Castor Corporation	1101 N 161 E Ave	Tulsa	OK 74116	A
Lektron Industrial Supply,	P.O. Box 415	Claremore	OK 74018	F
Lewco, Inc.	7712-B North West Third	Oklahoma City	OK 73127	I
Lift Way Manufacturers	P.O. Box 124	Muldrow	OK 74948	I
Lighting Specialists	9529-A East 55th Place	Tulsa	OK 74145	G
Lincoln Land Surveyors	802 Hwy 18 North, P.O. Box 423	Chandler	OK 74834	G
Loggins and Associates	P.O. Box 674	Glennpool	OK 74033	F
M.R. Equipment Company,	P.O. Box 18228	Oklahoma City	OK 73154	F
Mabar Inc	1700 N Main	Fairview	OK 73737	A
Marilyn Gottshall	1700 ASP, Room 136	Norman	OK 73037	B
Martin Paintin Co. Inc	P.O. Box 95191	Oklahoma City	OK 73143	A
Metal Specialty Company,	P.O. Box 67	Broken Arrow	OK 74013-0067	F
Metro Construction, Inc.	P.O. Box 610	Sand Springs	OK 74063	F
MFI Corporation	4273 Will Rogers Parkway	Oklahoma City	OK 73108	F
Michael C. Sellers	4425 North 81 Hwy	Duncan	OK 73533	F
Moore Construction Co	Rt 2	Konawa	OK 74849	G
Mr. C's Welding	2400 N.E. 4th Street	Oklahoma City	OK 73117	F
Mr. Laxman P. Godhania,	1224 South Kelly Avenue	Edmond	OK 73034-3398	B
National Energy Savers,	Route 1 Box 1607	Fort Gibson	OK 74434	F
National Steel Erectors,	PO Box 709	Muskogee	OK 74402	A
Neolamp, Inc.	Box 207	Davis	OK 73030	A
Neosource, Inc.	5535 East 15th St.	Tulsa	OK 74112	A
NN Electronics	P.O. Box 231	Sapulpa	OK 74067	G
Nupar, Division of Baldor	Route 7 Box 225-B	Claremore	OK 74017	B

OKLAHOMA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Oklahoma Aerotronics, Inc.	P.O. Box 329	Hartshorne	OK 74547-0329	F
Oklahoma Electrical	4901 North Sewell/P.O. Box 349	Oklahoma City	OK 73101	B
Oklahoma Landscape	P.O. Box 271	Newalla	OK 74857	A
Oklahoma Roof Truss	P.O. Box 576	Adamore	OK 74820	G
Oklahoma Steel & Wire	P.O. Box 220	Madill	OK 7346	B
P & R Supply Company,	P.O. Box 690094	Tulsa	OK 74169	F
P'rJ Grafix	820 Northeast 63rd Street Suite A	Oklahoma City	OK 73105	F
Parks Construction	1508 Jefferson	Woodward	OK 73801	A
Patton Construction	Route 2 Box 303	Tahlequah	OK 74464	F
Power Computing	2302 S Ironwood	Broken Arrow	OK 74012	C
Process Pipe Fabricators,	P.O. Box 1265	Claremore	OK 74018	A
Proguard	P.O. Box 678	Nowata	OK 74048	A
Q.R. Tolbert Building	P.O. Box 455	Glenpool	OK 74033	F
R & G Williams Trucking,	409 NW 82nd Street	Oklahoma City	OK 73114-3307	I
Ra-Nav Laboratories Inc	P O Box 12224	Oklahoma City	OK 73157	A
Red Oak Recycling	Route 1 Box 150	Rinaling	OK 73456	H
Right Choice Corporation	P.O. Box 145	Cushing	OK 74023	A
Robert M. Douglas	P.O. Box 180	St. Louis	OK 74866	A
Ronald R. Jackson	CS Box AO 241	Oklahoma City	OK 73162	F
S & J Contractors, Inc.	P.O. Box 18521	Oklahoma City	OK 73118	F
S & S Construction	501-D N. Redbud	Broken Arrow	OK 74012	F
SDC Construction	5310 West Sixth Street	Stillwater	OK 74074	A
Selmon Enterprises, Inc.	2340 Industrial Blvd	Norman	OK 73069	F
Sequoyah Industries, Inc.	P.O. Box 610	Jay	OK 74346	F
Sequoyah Print Shop	Route 3 Box 522	Claremore	OK 74017	I
Service & Technology	105 SW Penn	Bartlesville	OK 74003	F
Shadetree Enterprises	P.O. Box 503	Fairview	OK 73737	A
Sharon K. Willard Trucking	Route 2 Box 131A	Stonewall	OK 74871	G
Sharon Kay & Bobby	Route 2 Box 131A	Stonewall	OK 74871	I
Shawnee Pacific	5915 NW 23rd Suite 111	Oklahoma City	OK 73127	F
Shawnee Steel Company	P.O. Box 1344	Shawnee	OK 74802-1344	A
Silicone Specialities, Inc.	P.O. Box 50009	Tulsa	OK 74150	A
Slattery Construction	111 Sunset Lane	Woodward	OK 73801	A
Sludge Disposal, Inc.	516 W. California, Ste. 200	Oklahoma City	OK 73102	G
Smith Comprehensive	P.O. Box 10327	Midwest City	OK 73110	G
Solvent Manufacturing Co	1517 OCama Blvd	Midwest City	OK 73110-7945	G
Solvent Manufacturing	1517 Ocama Blvd	Midwest City	OK 73110-7946	G
Southwest Aeroservice,	1501 E. 4th Place	Tulsa	OK 74120	A
Southwest Electric	2617 S. Agnew	Oklahoma	OK 73148	A
Southwest United	422 South St. Louis	Tulsa	OK 74120	A
Southwestern Porcelain	P.O. Box 8	Sand Springs	OK 74063	A
Spradling & Associates,	1660 E. 71st Street Suite 2P-2	Tulsa	OK 74136	I

OKLAHOMA
FIRMS INTERESTED IN SECL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Start-Up Business	4628 North St. Louis Ave	Tulsa	OK 74126	I
Steel Coating, Inc.	P.O. Box 1454	Muskogee	OK 74402-1454	G
Stone Computer Supply	8757 S Lewis	Tulsa	OK 74137	A
Stone Sales Corporation	7700 North Hudson Suite 10	Oklahoma City	OK 73116	A
Storage Systems, Inc.	13 NW 132	Oklahoma City	OK 73114	A
Summit Machine Tool	518 North Indiana Ave	Oklahoma City	OK 73106	B
Talbert Industries, Inc.	1604 E. Hwy 66	El Reno	OK 73036	A
Tate Manufacturing, Inc.	6500 West Hwy 70	Durant	OK 74701	G
Teaco, Inc.	P.O. Box 472261	Tulsa	OK 74147	I
Teddy R. Walker	Box 101	Wayne	OK 73095	F
Terra Construction, Inc.	P.O. Box 96325	Oklahoma City	OK 73143	A
The Benham Group, Inc.	P.O. Box 20400	Oklahoma City	OK 73156-0400	B
The Creative Department,	3030 Northwest Expressway Suite	Oklahoma City	OK 73112	A
The Decorator's Dream	Route 2 Box 164	Watoaga	OK 73772	G
Thomas H. Glenn	P. O. Box 459	El Reno	OK 73036	A
Thompson Distributing	13821 East 100th Street North	Owasso	OK 74055	I
Times Journal Publishing	1 NW 6	Oklahoma City	OK 73102	B
Tom Ballard	P.O. Box 721	Jenks	OK 74037	F
Toure Law Firm, P.C.	P.O. Box 11494	Oklahoma City	OK 73136	F
Trans-Tel Central, Inc.	P.O. Box 6180	Moore	OK 73153	I
Trover's Security Service,	P.O. Box 1402	McAlester	OK 74502	F
Turnbow Trailers, Inc.	Box 300	Oilton	OK 74052	A
U.S. Communications	9925 S. Penn Suite 100	Oklahoma City	OK 73159-6930	I
UniBridge Systems, Inc.	P.O. Box 8, 4th & Oklahoma	Knowles	OK 73847	A
Unit Liner Company	P.O. Box 3908	Shawnee	OK 74802	A
United Sewing Agency	2100 W. Arkansas Box 816	Durant	OK 74702	A
Universal Custodial	P.O. Box 382	Enid	OK 73702	A
Universal Machine	P.O. Box 399	Piedmont	OK 73078	A
Unlimited Travel of	808 West Cherokee	Sallisaw	OK 74955	I
Vision Manufacturing	Route 2 Box 188Q	Shawnee	OK 74801	F
VMI, Inc.	1125 N. Fleetwood	Cushing	OK 74023	A
Waldon, Inc.	201 West Oklahoma Ave	Fairview	OK 73737	A
Walkingstick, Inc.	P.O. Box 2444	Bartlesville	OK 74005	F
Waste-Not Wastes, Inc.	P.O. Box 721242	Oklahoma City	OK 73172-1242	F
Williams Secretarial	523 S. Barclay	Dewey	OK 74029	G
Woods Construction	Route 5 Box 52	Coalgate	OK 74538	F
XY Resources	Box 9 Ardmore Air Park	Ardmore	OK 73446	A
Yates Construction	318 West Highland	Shawnee	OK 74801	G
Zuzax Development	5200 South Yale Suite 400	Tulsa	OK 74135	A

OREGON
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Audio Precision	5465 S W Western Ave Ste J	Beaverton	OR 97075	A
Precision Castparts Corp	4600 S E Harney Dr	Portland	OR 97206	B

PENNSYLVANIA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Armco Advanced Materials	P.O. Box 1609	Butler	PA 16003-1609	B
Bentley-Harris Mfg Co	241 Welsh Pool Rd	Lionville	PA 19353	B
Besco Manufacturing	P.O. Box 68 Zeigler Street	Zelienople	PA 16063-0068	A
Business Development	916 North Highland Ave	Pittsburgh	PA 15206-2108	A
C-Tec Communications	256 N Sherman St	Wilkes-Barre	PA 18702	B
Cattron, Inc.	29 North Second Street	Sharpsville	PA 16150	A
Cressona Aluminum		Cressona	PA 17929-0129	B
Data Con	207 Witmer Rd	Horsham	PA 19044	A
Durabla Manufacturing	140 Sheree Blvd/P.O. Box 700	Lionville	PA 19353	A
Electro Tech Industries	1770 East Lancaster Ave Ste 15A	Paoli	PA 19301	A
Flex-Y-Plan Industries Inc	6960 West Ridge Rd	Fairview	PA 16415-0829	A
Frank W. Winne 7 Son,	44 N. Front St.	Philadelphia	PA 19106	A
Homestead Industries, Inc.	Box 348 200 Main Street	Coraopolis	PA 15108	A
Horix Manufacturing	P.O. Box 9324	Pittsburgh	PA 15225	A
Ionics, Inc. Bridgeville	3039 Washington Pike	Bridgeville	PA 15017	A
Koppers Industries, Inc.	2000 Koppers Building	Pittsburgh	PA 15219	B
Kurt J. Lesker Company	1515 Worthington Ave	Clairton	PA 15025	A
L & S Machine Company,	RD2 Box 317 Donohue Rd	Latrobe	PA 15650	A
Lawrence T. Hall	RD#1 Finney Rd	Elizabeth	PA 15037	F
Lebanon Foundry &	101 Lehman St	Lebanon	PA 17042	B
Leybold Vacuum Products,	5700 Mellon Road	Export	PA 15632	B
Liberty Precision Tooling,	1061 Main Street	North	PA 15642-2426	G
Metalstand Company	11200 Roosevelt Blvd	Philadelphia	PA 19115	A
Mitchell Fibercon Inc	100 South Third St	Evans City	PA 16033	A
Netzsch Incorporated	119 Pickering Way	Exton	PA 19341	A
Peak Technical Services	3424 William Penn Hwy	Pittsburgh	PA 15335	B
Phoenix Contact	P.O. Box 4100	Harrisburg	PA 17111	A
Precise Plastic Products	501 Mosside Blvd	East	PA 15035	B
Robicon Corporation	100 Sagamore Hill Road	Pittsburgh	PA 15239	B
Sorbus, Inc.	50 East Swedesford Road	Frazer	PA 19355	B
Stackpole Carbon	201 Stackpole Street	St. Mary's	PA 15857	B
Stainless Metal & Alloy Inc	PO Box 3699	Philadelphia	PA 19125	G
Stanley-Vidmar, Inc.	11 Grammes Road	Allentown	Pa 18103-1151	B
Superior Products	5615 Grand Ave	Pittsburgh	PA 15225	A
The Carbon/Graphite	PO Box 387	St Mary's	PA 15857	B
Three H Enterprises	210 East Crawford Ave	Connellsville	PA 15425	G
Transport International	2 Bala Plaza	Bala Cynayd	PA 19004-1597	B
Unitrack Industries Inc	1372 Enterprise Dr	West Chester	PA 19380	A

RHODE ISLAND
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	CI
FWF Industries Inc	PO Box 6445	Providence	RI 02940	I

SOUTH CAROLINA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Fuller Enterprises Inc	30 Old Mill Rd Suite 110	Greenville	SC 29607	A

TENNESSEE
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Advanced Drainage	1730 General George Patton Dr	Brentwood	TN 37027	B
Alert Terminal Warehouse	P.O. Box 499	Memphis	TN 38101	A
Allen & Hoshall, Inc.	2430 Poplar Ave	Memphis	TN 38112	B
American Magnetics, Inc.	P.O. Box 2509, 112 Flint Rd	Oak Ridge	TN 37831	A
Bristol Metals (Subsidiary	P.O. Box 1589	Bristol	TN 37621	B
Business Dynamics, Inc.	7828 Rutledge Pike	Knoxville	TN 37914	F
ERC/EDGe	725 Pellissippi Parkway	Knoxville	TN 37933	B
Guardsmark Inc	22 South Second St	Memphis	TN 38103	B
Larry V. Bullock	1177 Madison Suite 401	Memphis	TN 38104	F
New Rise, Inc.	P.O. Box 161035	Memphis	TN 38116	F
PAI Corporation	116 Milan Way	Oak Ridge	TN 37830	F
Pathway Bellows Inc	PO Box 3027/115 Franklin Rd	Oak Ridge	TN 37831	B
Piercey Employment	1029 Campbell St Ste 201	Jackson	TN 38301	G
Polk Grading, Inc./dba P	7186 Winchester Rd	Memphis	TN 38115	F
Wright Industries Inc	PO Box 17914/707 Spence Lane	Nashville	TN 37217-0914	A
Wright Industries, Inc.	707 Spence Lane	Nashville	TN 37217-0914	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
3M Engineering Systems	2121 Santa Anna Ave	Dallas	TX 75228-0158	B
A - 1 Rental	P.0. Box 7878	Ft. Worth	TX 76111	B
A & B Transfer & Storage	1405 Crescent	Carrollton	TX 75006	A
A C & T Security Agency	434 W Keist Suite 230	Dallas	TX 75224	F
A E Krutilek, Jr CPA	320 N 9th St Ste 410	Midlothian	TX 76065	A
A & E Machine Shop, Inc.	Box 0190	Lone Star	TX 75668	A
A & G Engraving	1822 Siverside Dr	Grapevine	TX 76051	G
A.I.E. Studios, Inc.	3905 Braxton Drive	Houston	TX 77063	A
A & I Warehouse	500 A So Good Latimer	Dallas	TX 75226	G
A. & J. Mechanical &	1917 Windlea Dr	Euless	TX 76040	G
A.J. Rod Company, Inc.	418 West Main Street	Grand Prairie	TX 75051	G
A.M. Castle &	P.O. Box 531017	Grand Prairie	TX 75053	B
A R Enterprises	5007 Windy Meadow Drive	Plano	TX 75023	G
A R S Engineers Inc	5401 N Central Expwy Ste 350	Dallas	TX 75205	F
A T C Fiber Optic Systems	1701 North Greenville Ave Suite 1002	Richardson	TX 75081	A
A to Z Office Supply &	2429 East Loop 820 North	Fort Worth	TX 76118	A
A.V.E.D.-S.W.	4470 Spring Valley Rd	Dallas	TX 75244	A
A & W Bearings & Supply	4932 Sharp St	Dallas	TX 75247	A
A-1 Custom Hauling	Rt 1 Box 761	Navasota	TX 77868	A
A-1 Plastic Supply	13700 Gamma Road	Dallas	TX 75244	B
-A-1 Rental	PO Box 7878	Ft Worth	TX 76111	A
A-Action Moving	703 Dumont	S. Houston	TX 77587	G
AAA Waste Systems, Inc.	P.O. Box 883	Midlothian	TX 76065	A
Abatis, Inc.	P.O. Box 1083	Granbury	TX 76048	G
ABB Control, Inc.	17304 North Preston Rd Suite 800	Dallas	TX 75252	B
ABC Doors of Dallas, Inc.	4014 Scottsdale Dr. P.O. Box 270489	Dallas	TX 75227	A
ABCO Office Supply Co	2710 Cedar C Rest Blvd	Dallas	TX 75203	F
Abernathy Tool & Die, Inc.	5941 Midway Road	Fort Worth	TX 76117	A
Able Machinery Movers,	P. 0. Box 814345	Carrollton	TX 75006	A
Ables Buildings & Sheet	PO Box 81	Ennis	TX 75120	A
ABM Security Services	2300 Valley View Lane Suite 1025	Irving	TX 75062	B
Abner & Associates	P.O. Box 120754	Arlington	TX 76012-0754	I
Abner & Associates	P.O. Box 120754	Arlington	TX 76012-0754	I
Above All Roofing	PO Box 733	Lancaster	TX 75146	A
Absolute Security	PO Box 313	Bedford	TX 76095	A
Accent Wallcovering &	5114 Camp Bowie Blvd	Fort Worth	TX 76107	G
Access Communication	2200 Ross Ave Suite 710	Dallas	TX 75201	A
Access Doors of Texas,	2601 Spinks Rd	Flower Mound	TX 75028	G
Accessories A La Carte	4901 Canberra	Arlington	TX 76017	G
Accountemps	Three North Park East #200	Dallas	TX 75231	B
Accounting Personnel, Inc.	5307 E. Mockingbird, Suite 401	Dallas	TX 75206	A
Accu-Guard Inc	11500 Stemmons Frwy	Dallas	TX 75229	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Accucom	520 East Central Parkway #116	Plano	TX 75074	F
Accurate Forms &	8204 Elmbrook Dr., Suite 360	Dallas	TX 75247-4000	A
AccuServ	PO Box 821412	Dallas	TX 75231	Co
Accutronics, Inc.	10606 Shady Trail, Suite 12	Dallas	TX 75220	F
Ace Bolt & Screw	721-23 North Alamo	San Antonio	TX 78215	A
Ace Casters Inc	2308 Irving Blvd	Dallas	TX 75207	A
Ace Electro-Fab	PO Box 1160	Alvarado	TX 76009	G
Ace Metal Products	4774 Algiers St	Dallas	TX 75207	A
Ace Sign Inc	144 S Twin City Hwy	Nederland	TX 77627	A
Ace World Wide Moving &	3409 Century Center Ste 105	Irving	TX 75062	G
Aces A/C Supply, Inc.	11110 North Stemmons Freeway	Dallas	TX 75229	A
Acme Brick Company	PO Box 29311/11261 Shady Trail	Dallas	TX 75229	B
Acme Computers	4801 Brentwood Stair Rd #405	Ft Worth	TX 76103-1731	A
Acme Electric Serv Inc	1335 Plowman Ave	Dallas	TX 75203	A
Acme Mobile Offices Inc	3100 W Division	Arlington	TX 76012	A
Acton Mobile Industries Inc	20o Industrial Blvd	Mansfield	TX 76063	A
Adkins Equipment &	PO Box 5651	Pasadena	TX 77508	G
Adra Electric Products, Inc.	P.O. Box 153167	Irving	TX 75015-3167	A
Adrian Research Group	13740 Midway Rd Suite 702	Dallas	TX 75244	F
ADT Security Systems,	4001 Fain Street	Fort Worth	TX 76117	B
Advanced Electro	2705 Industrial Ln.	Garland	TX 75041	A
Advanced Entry Systems	PO Box 870067	Dallas	TX 75287	G
Advanced Image Systems	2331 W Northwest Hwy	Dallas	TX 75220	B
Advanced Storage	10855 Rockley Rd	Houston	TX 77099	A
Advantage Office Products	2560 Electronic Lane #111	Dallas	TX 75220	A
Advantage Rent-A-Car	P.O. Box 5-D	San Antonio	TX 78217	A
Advantage Renta-A-Car	3515 Manor Rd	Austin	TX 78723	A
Advantage Transporation	2225 E Randol Mil mRd #324	Arlington	TX 76011	I
Advertising & Marketing	P.O. Box 7535	Waco	TX 76714-7535	B
Aero Seats and Systems	6801 Exchange Dr	Mansfield	TX 76063	I
Aero Vesta Inc	PO Box 100249	Midland	TX 79711	A
Affilated Sales Group	228 Martha	Euless	TX 76040	G
AG Transporation, Inc.	Box 659	Seminole	TX 79360	A
AG Transportation, Inc.	Box 659	Seminole	TX 79360	A
Age Industries Inc	Rt 5 Box 473	Cleburne	TX 76031	A
Aggreko Inc	1337 B E Parkerville Rd	DeSoto	TX 75115	A
AGS Machine Service Inc	217 Yorktown	Dallas	TX 75208	A
Aguirre Architects	12700 Park Central Drive, Suite 1505	Dallas	TX 75251	F
Aguirre Architects, Inc.	12700 Park Central Dr #1508	Dallas	TX 75251	F
Aid Consulting Engineers	10830 Composite Drive	Dallas	TX 75220	A
Air 1 Express	P.O. Box 610025	DFW Airport	TX 75261-0025	A
Air Power Tool & Hoist Inc.	4435 Mint Way	Dallas	Tx 75236	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Air Products and	616 Six Flags Drive, Suite 416	Arlington	TX 76011	B
Air Routing International	2925 Briarpark Dr Suite 610	Houston	TX 77042	B
Air Surveys by Toler	Wolters Industrial Park Building #231	Mineral Wells	TX 76067	G
Air-Dreco	10610 Newkirk Ste 107	Dallas	TX 75220-2304	A
Airco Welding Supply	2615 Joe Field Rd	Dallas	TX 75229	B
Airport Lighting Systems	2803 Dairy Milk Ln	Dallas	TX 75229	A
Airways Travel	Hwy 77 N Northgate Plaza #614	Waxahachie	TX 75165	G
Airways Travel Service	PO Box 129	Waxahachie	TX 75165	A
Al Hagler Real Estate Inc	1701 N Collins Ste 303	Richardson	TX 75080	A
Al Mar Enterprises	2205 W Division C-6	Arlington	TX 76012	F
Al Mar Enterprises	2205 W.Division Suite H4	Arlington	TX 76012	F
Alamo Riggers &	15440 Tradesman Dr	San Antonio	TX 78249	A
Alamo Technology, Inc.	301 South Frio Suite 400	San Antonio	TX 78207	F
Alamosa Company	PO Box 428	Vega	TX 79092	A
Alan Plummer and	841 West Mitchell Street	Arlington	TX 76013	A
Alanjack Steel Inc.	P.O. Box 823 / 250 Eastgate Dr.	Midlothian	TX 76065	A
Albert H. Halff Associates,	8616 Northwest Plaza Drive	Dallas	TX 75225-4211	B
Alexander's Machine &	3708 N Main	Ft Worth	TX 76106	A
All American	6101 S.W. Freeway Suite 406	Houston	TX 77057	A
All American Moving	12053 Corporate Drive	Dallas	TX 75228	B
All Mark Impressions	P.O. Box 3275	Arlington	TX 76010	G
ALL PRODUCTS FOR	P.O. Box 171701	Arlington	TX 76003	A
All Star Security Inc	788 S Floyd	Richardson	TX 75080	A
All State Steel Co.	P. 0. Box 9818	Houston	TX 77213-9818	B
All Tex Chemical &	P.O. Box 224968	Dallas	TX 75222	A
All-Tex Plumbing Supply	9743 Brockbank Dr	Dallas	TX 75220	G
Allegro Systems, Inc.	4400 Fiesta Circle East	Fort Worth	TX 76133	G
Allen Adams	Route 9 Box 4192	Lufkin	TX 75901	A
Allen R. Sorrells	3412 Adeline	Waco	TX 76708	G
Allen-Bradley Company	3410 Midcourt Ste 102	Carrollton	TX 75006	B
Alliance Services, Inc.	1756 Rhome Street	Dallas	TX 75229	A
Alliant Computer Systems	4425 West Airport Freeway Suite 220	Irving	TX 75062	A
Allied Components	231 Lopp 820 N.E. Suite 102	Hurst	TX 76053	A
Allied Electronics	401 E 8th St	Ft Worth	TX 76102-5598	B
Allied Security Inc	1515 W Mockingbird Ln #105	Dallas	TX 75235	B
Allsafe Environmental	PO Box 190	Midland	TX 79702	A
Allstate Security Industries	PO Box 10145	Amarillo	TX 79116	A
Alman Electric Inc	4850 Samuell Blvd	Mesquite	TX 75149	A
Almanco Sheet Metal Inc	8310 C F Hawn Frwy	Dallas	TX 75217	A
ALP Printing Inc	4650 S Hampton Ste 97	Dallas	TX 75232	F
Alpha Computer Rental &	735 W Shady Grove Rd	Irving	TX 75060	A
Alpha Energy Laboratories	2100 Rd To Six Flags	Arlington	TX 76011	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Alpha Omega Security	P.O. Box 244	Waco	TX 76703	I
Alpha PC Technologies	716 Marble Canyon Cir	Irving	TX 75063	F
Alpha-Dyne Corporation	2610 Freewood Dr	Dallas	TX 75220	G
Alphonso Solomon &	5787 S. Hampton Rd Suite 106	Dallas	TX 75232	F
Alsay Incorporated	6615 Grant St	Houston	TX 77066	A
Alternate Systems, Inc.	P.O. Box 867269	Plano	TX 75086	A
Altex Industries Inc	3911 Cobblers	Dallas	TX 75287	F
Alvarez & Associates	P.O. Box 465	Victoria	TX 77902	A
Alvarez & Associates	P.O. Box 465	Victoria	TX 77902	F
Amarillo Chamber Of	PO Box 9480	Amarillo	TX 79105	A
Amarillo Hardwoods	1900 W 6th St	Amarillo	TX 79106	A
Amarillo Hose & Supply	PO Box 2128/706 S Grant	Amarillo	TX 79105-2128	A
Amarillo Printing Co Inc	PO Box 406	Amarillo	TX 79105-0406	A
Amarillo Pump & Supply	PO Box 3786	Lubbock	TX 79452	A
Amarillo Testing and	2911 Amarillo Blvd West	Amarillo	TX 79106	A
Amcad Inc	1325 Whitlock #314	Carrollton	TX 75006	A
Amco Enterprises	4209 Hahn Blvd	Ft Worth	TX 76117	A
Ameri-Tech Financial	P.O. Box 1244	Desoto	TX 75115	A
Ameri-Tech Financial	P.O. Box 1244	De Soto	TX 75115	A
Ameri-Tech Financial	P.O. Box 1244	DeSoto	TX 75115	A
Americal Laser Products,	900-B East Miracle Mile	McAllen	TX 78501	A
American 1 Hour	797 W. Wheatland	Duncanville	TX 75116	F
American Cleaning	10511 Church Rd Ste 200	Dallas	TX 75238	F
American	P.O. Box 810660	Dallas	TX 75381-0660	A
American Desk	PO Box 6107	Temple	TX 76503-6107	B
American Express Travel	5080 Spectrum Dr Suite 612W	Dallas	TX 75248	B
American Forms	1310 W Cedar/Po Box 120501	Arlington	TX 76012	A
American Global Services	4750 Bryant Irvin Rd Suite 808-245	Fort Worth	TX 76132	I
American Global Services	6322 Brookgate Dr	Arlington	TX 76016	I
American Housekeeper	2815 Valley View	Dallas	TX 75234	A
American Hydro-Grass	3880 Valley View Ln	Irving	TX 75062	A
American Light, Inc.	10630 Newkirk Street #108	Dallas	TX 75220	A
American Photographics	797 W Wheatland	Duncanville	TX 75116	A
American Rental Center	4033 Maple Ave	Odessa	TX 79762	A
American Sling Company,.	2121 Solona Street	Fort Worth	TX 76117-5338	A
American Technical	9001 Airport Blvd Ste 511	Houston	TX 77061	A
American Trophy &	221 N Hampton	DeSoto	TX 75115	I
Ameritrans, Inc.	6210 N. Beltline Road Suite 160	Irving	TX 75063	A
Amfan Corporation dba R	6223 Toronto St	Dallas	TX 75212	A
Amicus Compter Systems	6671 Southwest Frwy #501	Houston	TX 77074	I
Amicus Computer	6671 Southwest Frwy #501	Houston	TX 77074	I
Amos Electric Supply Co	5120 S General Bruce/Po Box 3766	Temple	TX 76502	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
AMTEX Corporation	832 E. Walnut	Garland	TX 75040	A
Ana-Lab Corp	2600 Dudley Rd	Kilgore	TX 75662	A
Analog Devices, Inc.	1701 Gateway Blvd Suite 405	Richardson	TX 75080	B
Anderson Consulting	901 Main St Ste 5600	Dallas	TX 75202	B
Anderson Glass Company	401 E. Henderson	Cleburne	TX 76031	G
Anderson Glass Company	401 E. Henderson	Cleburne	TX 76031	G
Anderson Laboratories,	5901 Fitzhugh Avenue	Fort Worth	TX 76119	A
Andrews & Foster Drilling	PO Box 348	Athens	TX 75751	A
Andy Hlavaty & Associated	901 Waterfall Way Suite 403	Richardson	TX 75080	A
Angiel Electrical	4311 Belmont Ave	Dallas	TX 75204	A
Ann Sullivan Associates,	7906 Brookhollow Rd	Dallas	TX 75235	G
Annette Kiel & Associates	3621 Ashford Avenue	Fort Worth	TX 76133	G
Answer Express	PO Box 24	Duncanville	TX 75138	G
Antares	P.O. Box 1011	Grapevine	TX 76051	G
Anthony Crane Rental Of	PO Box 14707	Ft Worth	TX 76117	B
Anvil Cases, Inc	9858 Plano Rd Suite 100	Dallas	TX 75238	B
APAC-Texas, Inc. Texas	P.O. Box 224048	Dallas	TX 75222-4048	B
Apartment Home Search,	13500 Midway Suite 213	Dallas	TX 75244	G
Apex Supply Company	180 Oak Lawn (P.0. Box 565486	Dallas	TX 75356-5486	G
APG Lime Corporation	Route 6 Box 662	New Braunfels	TX 78132-5011	B
APG Security Inc	2877 LBJ Frwy Ste 190	Dallas	TX 75234	B
APM & Assocaites, Inc.	P.O. Box 710833	Dallas	TX 75371	F
APM & Associates Inc	PO Box 710833	Dallas	TX 75371	F
Apogee Group, Inc./dba	2606 West Marshall Drive Suite 101	Grand Prairie	TX 75051	G
Appalachian Computer	2235 Ridge Rd	Rockwall	TX 75087	B
Apple Etc	PO Box 1111	Lancaster	TX 75146	G
Applications Plus, Inc.	122 W. Carpenter, Frwy #535	Irving	TX 75039	A
Applied Energy Company,	P.O. Box 550547	Dallas	TX 75355-0547	A
Applied Resource	2305 Cedar Springs Suite 150	Dallas	TX 75210	A
ARA/Corr Refreshment	2120 Hutton #100	Carrollton	TX 75006	B
Architectural Habitat Inc	13640 Omega Rd	Dallas	TX 75244	A
Architectural Portraits Co	PO Box 570571	Houston	TX 77257-0571	F
Arlington Travel Advisors	2301 N. Collins, Suite 126	Arlington	TX 76011	G
Arm-Tex Corp	116 Highland Meadow	Coppell	TX 75019	A
Armstrong Forensic	330 Loch'n Green Trail	Arlington	TX 76012	A
Armstrong Insurance	200 S Rogers #307	Waxahachie	TX 75165	A
Armstrong Metals	6328 Normandy Ste 1	Ft Worth	TX 76112	F
Arnold Enterprises	Rt 5 Box 667	Gilmer	TX 75644	A
Arredondo Brunz &	11050 Plano Rd	Dallas	TX 75238	F
Arredondo, Brunz &	11050 Plano Rd	Dallas	TX 75238	F
Arrick Robotics	Po Box 1574	Hurst	TX 76053	G
Arrington's Custom	310 S Acres	Dallas	TX 75217	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
ARRK Creative Network	2156 West Northwest Highway Suite	Dallas	TX 75220	B
Arrow Magnolia	2646 Rodney Ln/POBox 59089	Dallas	TX 75229	A
Arrow Metals	1010 East Walnut	Garland	TX 75040	A
Arrowhead Contractors	PO Box 1209	Kilgore	TX 75662	G
Arrowhead Contractors	P.O. Box 4347	Longview	TX 75662	G
ARS Engineers, Inc	5401 N Central Expwy #350	Dallas	TX 75205	F
Art Forms	409 South Forest Crest	Garland	TX 75042	
ASAP Machine Shop	Route 3 , 8 Merridian Drive	Gladewater	TX 75647	F
ASC Pacific Inc	404 E Dallas Rd	Grapevine	TX 76051	B
Ascot Inc	2533 Leprechaun Lane	Houston	TX 77017	A
Asel Art Supply Inc	2701 Cedar Springs	Dallas	TX 75201	A
Associated Graphics	5220 Spring Valley #625	Dallas	TX 75240	I
Associated Office	6718 Oakbrook Blvd	Dallas	TX 75235	A
Associated Spring/Barnes	P.O. Box 210009	Dallas	TX 75211	B
Astro-Johnny Sanitation	PO Box 789	Jacksonville	TX 75766	F
AT Laboratories	PO Box 5552	Arlington	TX 76005	G
At Laboratories, Inc.	P.O. Box 5552	Arlington	TX 76005	G
AT&T	2501 Parkview Suite 200	Fort Worth	TX 76102	B
ATC	1111 W. Mockingbird Lane Suite 200	Dallas	TX 75247	B
ATC Fiber Optic Systems	1701 N Greenville Ave #1002	Richardson	TX 75081	A
ATEC Associates, Inc.	11356 Mathis Ave	Dallas	TX 75229-3157	B
Atico	PO Box 100	Forreston	TX 76041	A
Atkins Electric	515 N Cedar Ridge Rd Ste 7G	Duncanville	TX 75116	A
Atlantic Technical	800 West Belt South	Houston	TX 77042	B
Atlas Air Conditioning	1289 North Post Oak Rd #190	Houston	TX 77055	B
Atlas Metal Works Inc.	P.O. Box 225208	Dallas	TX 75222	A
ATS, Inc.	8131 LBJ Freeway #333	Dallas	TX 75251	B
Audrey Smith Lumber Co	109 W Pearl	Granbury	TX 76048	G
Austin Design Associates,	3701 Bee Cave Road, Suite 102	Austin	TX 78746	F
Austin Electric Company	3009 Morton St	Ft Worth	TX 76107	A
Autocall, Inc.	13500 Midway Rd Suite 405	Dallas	TX 75244	B
Automated Accounting	Rt. 4, Box 27A	Grandview	TX 76050	G
Automated & Custom Food	7700 Brookhollow Rd	Dallas	TX 75235	B
Automatic Chef Company	300 South Second Street	Waco	TX 76701	A
Automation & Robotics	7300 Jack Newell Blvd S	Fort Worth	TX 76118	B
Availability Temporary	400 N St Paul Ste 1250	Dallas	TX 75201-3686	G
Avenue Fuel Dist.	407 W. Ennis Ave	Ennis	TX 75119	A
Aviles Engineering	5790 Windfern	Houston	TX 77041	F
AVS Food Service Inc	7711 Sand Street	Ft Worth	TX 76118	B
Azbell Electronics	1813 Speight	Waco	TX 76706	A
Aztec ManufacturingCo.	P.O. Box 668	Crowley	TX 76036	A
B B Beers	PO Box 653	Sulphur	TX 75482	A

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FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
B & B Cont & Supply Co	4831 Lakawana	Dallas	TX 75247	B
B & C Embroidery, Inc	4520 Vineyard Trail	Mesquite	TX 75150	G
B. C. M. Engineers, Inc.	The Princeton Building, #901 14651	Dallas	TX 75240	B
B & F Construction	5787 S Hampton Ste 230	Dallas	TX 75232	B
B.F.I. Industries	P.O. Box 13150	Arlington	TX 76094-0150	B
B & G Reproductions	8323 Gulfwood Lane	Houston	TX 77075	F
B Gates Company Inc	PC Box 185519	Ft Worth	TX 76181	A
B & H Delta Janitorial	2714 Lenway	Dallas	TX 75215	F
B J's Delightfully Clean Inc	2135 Mouser	Dallas	TX 75203	I
B & K Precision/Maxtec	8350 Meadow Rd Suite 184	Dallas	TX 75231	A
B L Nelson & Associates	5999 Summerside Dr Suite 202	Dallas	TX 75252	A
B & M Sand & Gravel	P.O. Box 721	Rockwall	TX 75087	B
B & N Concrete Cutting	1506 Stanwood	Cleburne	TX 76031	G
B. Ward & Associates, Inc	2600 Race Street, suite A	Fort Worth	TX 76111	F
B/H Constructors	PO Box 207	East Bernard	TX	A
Bailey Safeguards	2403 E. Lancaster	Fort Worth	TX 76103	A
Bailey Tool and	906 Mercury Ave	Duncanville	TX 75137	A
Bailey Vaught Robertson &	1100 Thanksgiving Tower	Dallas	TX 75201	A
Bairfield Dump Truck	Rt 1 Box 1567	Athens	TX 75751	B
Baker-Shiflett, Inc.	P.O. Box 15822	Fort Worth	TX 76119	A
Baldwin Metals, Inc.	1901 West Commerce	Dallas	TX 75208	A
Bali Blinds	408 Arlington St	Houston	TX 77007	A
Ballard & Szurgot, Inc.	P.O. Box 545	Burleson	TX 76028	A
Balt, Inc.	P.O. Box 713	Cameron	TX 76520	A
Balzers / Lou Sleigher	13999 Goldmark Dr. Suite 425	Dallas	TX 75240	B
Bandy & Associates	7999 Hansen	Houston	TX 77061	A
Barker Office Furniture	1122 East 51St. Street	Austin	TX 78723	A
Barr Company	2301 Greenlee Drive	Austin	TX 78703	G
Barracuda Technologies	315 Seahawk Dr	DeSoto	TX 75115	A
Barry Sales, Inc.	1600 East Arapaho Suite 105	Richardson	TX 75081	B
Barsco, Inc.	10940 Shady Trail	Dallas	TX 75220	A
Barsh Construction Co	PO Box 3193	Waco	TX 76707	A
Bart E. Johnson	738 Hood County Road, #310	Grandbury	TX 76048	F
Basicomputer	1625 W Crosby Rd Ste 110	Carrollton	TX 75006	B
Basler Electric Circuits	P.O. Box 1165--204 Highland Drive	Taylor	TX 76574	B
Bass & Hays Foundry, Inc	P.O. Box 531610	Grand Prairie	TX 75053-1610	A
Bavendale	2914 National Court	Garland	TX 75041	A
Baxter D. Honeycutt &	15600 Drummet Blvd. Suite 770	Houston	TX 77032	A
Baxter-Scientific Products	210 Great Southwest Pkwy	Grand Prairie	TX 75050	B
Bazan Roofing	4523 River Oaks Blvd.	Fort Worth	TX 76114	F
Bazan Roofing	4523 River Oaks Blvd	Fort Worth	TX 76114	F
BCM Professional	The Princeton Building, 14651 Dallas	Dallas	TX 75240	B

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FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Beall Concrete, Inc.	2725 Premier/P.O. Box 7505	Fort Worth	TX 76111	A
Bearco, Inc.	P.O. Box 560731	Dallas	TX 75356	G
Beard's Jewelers Catalog	200 North John Redditt	Lufkin	TX 75901	A
Bearden Protective	PO Box 545	Arlington	TX 76004-0545	G
Bee-Line Services, Inc.	P.O. Box 2096	Corsicana	TX 75151	A
Belcan Technical	2100 Highway 360 Suite 1800	Grand Prairie	TX 75050	B
Belden Wire and Cable	14651 N Dallas Parkway Ste 144	Dallas	TX 75240	B
Beldon Roofing &	P.O. Box 13380	San Antonio	TX 78213	B
BellSouth Communication	9150 Royal Lane Suite 170	Irving	TX 75063	B
Bennett Printing & Office	300 E Chambers	Cleburne	TX 76031	A
Bermah McKinney &	P.O. Box 735	Allen	TX 75002	G
Bernard Johnson Inc	5050 Westheimer	Houston	TX 77056-5608	B
Bernard Johnson	Stemmons Center Ste 730	Dallas	TX 75247-4223	B
Bernhard and Wright Inc	Rt 8 Box 324-3	Tyler	TX 75703	A
Berryhill Loyd Associates	17304 N Preston Rd Suite 800	Dallas	TX 75252	G
Besco, Inc.	3204 Lee Street	Greenville	TX 75401	A
'Best Equipment Company	P.O. Box 702	Addison	TX 75001	A
Best Equipment Service &	Box 702	Addison	TX 75001	A
Best Locking Systems Of	11426 E Northwest Hwy	Dallas	TX 75218	A
Best Southwest Focus	110 B North Hampton	DeSoto	TX 75115	I
Bestway Dump Service	Route 7 Box 212	Cleburne	TX 76031	I
Bestway Office Supply,	1108 Dobie Dr Suite 100	Plano	TX 75074	A
Beta Supply, Inc.	P.O. Box 5217	Houston	TX 77262	A
Beta Supply, Inc.	P.O. Box 5217	Houston	TX 77262	
Betco Scaffold	11308 S Pipeline Rd	Euless	TX 78040	A
Bethco Texas	2309 W Parker Rd	Plano	TX 75023	G
Betty's Monograms	6617 Parkview Drive	North Richland	TX 76180	G
BGR Architects-Engineers	5201 S. Westmoreland	Dallas	TX 75237	A
BHM Trucking, Inc.	112 Century Dr.	Cleburnr	TX 76031	G
Big 4, Inc.	P.O. Box 478	Hemphill	TX 75948	A
Big B Tire Company, Inc.	4344 Irving Blvd	Dallas	TX 75247	A
Big D Bolt & Screw Co.	11112 Grader Place	Dallas	TX 75238	A
Big M Construction	P.O. Box 448	Longview	TX 75606	A
Bighorn Division/Koelling	P.O. Box 8168	Longview	TX 75607	A
Bil-Mag Inc dba Five Star	2701 S I-35 W Exit 32	Burleson	TX 76028	F
Bilco Corporation	2116 N Lancaster-Hutchins Rd	Lancaster	TX 75146	F
Bilingual Secretarial And	6820 Meadowlake Circle	Dallas	TX 75214	G
Bill Jeter	Po Box 829	DeSoto	TX 75115	G
Bill Miller Company	4500 Ratcliff Suite 118	Dallas	TX 75248	A
Bill Richter Insurance	725D W. Henderson	Cleburne	TX 76031	A
Bill Watson Inc	313 Squirebrook Dr	DeSoto	TX 75115	A
Bill's Print Shop	Rt 5 Box 910	Burleson	TX 76028	A

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FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Billy C. Grate	P.O. Box 41765	Dallas	TX 75241	A
Billy R. McClendon	Route 1 Box 317	Diboll	TX 75941	A
Bink's Construction, Inc.	3055 Medlin Drive Suite 101	Arlington	TX 76015	A
Birchfield Enterprises	PO Box 884	Midlothian	TX 76065	I
Birds Radiator Service	101 B South Kaufman	Ennis	TX 75119	A
Birds Radiator & Welding	211 A South Highway 77	Waxahachie	TX 75165	A
Birdwell & Associates	2331 Gus Thomasson #128	Dallas	TX 75228	A
Biz-Club	1036 Explorer Drive	Duncanville	TX 75137	A
Blair Graphics, Inc.	1100 Capital Avenue	Plano	TX 75074	A
Blazek Building Supply Inc	1400 S Kaufman	Ennis	TX 75119	A
BLGY, Inc.	1600 West 38th Street, Suite 100	Austin	TX 78731	F
Bloxom Hardware & Auto	P.O. Box 15550	Fort Worth	TX 76119	A
Blue Chip Ice Company,	P.O. Box 1497	Whitney	TX 76692	A
Bluebonnet Computer	Route 6 Box 258	Granbury	TX 76048	A
Bluebonnet Office	4301 Alpha Road, Suite 101	Dallas	TX 75244	A
Blum & Winchester	1343 Houghton Dr.	Dallas	TX 75271	A
BMH Trucking Inc	112 Century Dr	Celburne	TX 76031	G
Boa Graphics Inc	2922 S E Loop 820	Ft Worth	TX 76140	G
Boarding Pass Travel	2831 W. Parker Suite 6	Plano	TX 75023	G
Bob's Rental Center Inc	2700 So Hwy 349	Midland	TX 79701	B
Bobby Joe Curry	1302 Red Oak	Ennis	TX 75119	G
Bobby Schuman	Box 853	Roanoke	TX 76262	A
Bodic Tool & EDM Supply	2410 Executive Dr.	Garland	TX 75041	A
Boggs Electric Co Inc	5303 Buford Jett Lane	Mesquite	TX 75180	A
Bond Cote Roofing	P.O. Box 371	Simonton	TX 77476	A
Bonilla Associates	1822 Jacksboro Highway	Fort Worth	TX 76114	F
Bonnie Business Forms	2691 Freewood	Dallas	TX 75220	A
Bonser - Philhower Sales,	689 W. Renner Rd. Suite 101	Richardson	TX 75080	A
Bookman & Son's	221 Conrad	Dallas	TX 75224	I
Boorhem-Fields Inc	PO Box 1177	Paris	TX 75460	A
BorTunCo	3519 Banning Street	Dallas	TX 75233	B
Boss Inc	Rt 6 Box 980	Conroe	TX 77302	A
Boss, Inc.	Route 6 Box 980	Conroe	TX 77302	A
Boullt's Welding Service,	Rt. 1 Box 253	Blum	TX 76627	A
Boundary Mark, Inc.	107 Division Court	Arlington	TX 76012	A
Bourg Collators Of Texas	1901 Royal Ln Ste 101	Dallas	TX 75229	A
Bowles & Edens Company	P.O. Box 569250	Dallas	TX 75247	B
Boxcrow Cement	P.O. Drawer 1170	Midlothian	TX 76065	B
Boyle Engineering Corp	8150 Brookriver Dr Suite S-301	Dallas	TX 75247	B
BPBO Ornemental Iron	2847 Century Street	Dallas	TX 75220	A
BR Metal Fabrication, Inc.	5323 Tex Oak	Dallas	TX 75235	A
Brady's Office Machine	1607-A North Main	Cleburne	TX 76031	A

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FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Brand-Sayers Architects	5454 LaSierra Ste 200	Dallas	TX 75231	A
Branham Industries Inc	PO Box 2425	Conroe	TX 77305	A
Bravo Ladders & Material	4743 Norma	Dallas	TX 75247	A
Brazos Components Inc	PO Box 460	Mineral Wells	TX 76067	A
Brazos Point, Inc.	P.O. Box 7558	Fort Worth	TX 76111	A
Breckenridge Lumber CO	PO Box 471	Breckenridge	TX 76024	A
Brenda Price Trucking	805 Nation Dr	Azle	TX 76020	G
Brewster Communications	6162 E Mockingbird Ste 206	Dallas	TX 75214	A
Bridgefarmer & Associates	1300 S. Sherman Suite 290	Richardson	TX 75081	A
Bridgefarmer & Associates	1300 South Sherman Suite 290	Richardson	TX 75081	A
Briggs-Weaver, Inc.	5000 Harry Hines Blvd	Dallas	TX 75235	B
Bright Truck Leasing Corp	2761 Oakland Ave	Garland	TX 75041	A
Britco of Fort Worth,Inc.	P.O. Box 470308	Fort Worth	TX 76147	G
Brite Marketing	2908 Lulu	Fort Worth	TX 76106-7329	G
Brookes Baker Surveyors	511 East Bluff Street	Fort Worth	TX 76102-2293	A
Brooks Contractors, Inc.	4605 Miller Avenue	Fort Worth	TX 76119	F
Brooks Diversified	117 Lakegrove Loop	Midlothian	TX 76065	A
Brooks/Collier	3131 East Side Suite 100	Houston	TX 77098	A
Brown Reynokds Watford	3535 Travis, Ste. 250, LB102	Dallas	TX 75204	A
Brown's Backhoe &	Route 1 Box 37AB	Grandview	TX 76050	F
Brown's Backhoe &	Route 1 Box 37AB	Grandview	TX 76050	F
Browning Sandblasting &	8012 Seymour Hwy	Wichita Falls	TX 76308	A
Browning-Ferris, Inc.	P.O. Box 679	Hutchins	TX 75141	B
Browning-Ferris Industries	P.O. Box 3151	Houston	TX 77253	B
Bruce Marcus	630 N. Hwy. 67	Cedar Hill	TX 75104	A
Bruce-Collins Elec Supply	1131 S. Airport Circle, #150	Euless	TX 76040	A
Bruton Manufacturing	P.O. Box 1208	Lamesa	TX 79331	A
Bucher Willis & Ratliff	3620 Old Bullard Rd Suite 206	Tyler	TX 75711	B
Budget Signs	3626 N MacArthur 230	Irving	TX 75062	A
Builders Electric	2509 Minnis Drive	Fort Worth	TX 76117	A
Builders Electric	2509 Minnis Drive	Fort Worth	TX 76117	A
Builders Equip & Sply Co	320 E Broadway	Ft Worth	TX 76104	A
Buildings & Properties	P.O. Box 210254	Dallas	TX 75211	A
Burco Systems	1208 Country Club Land Suite 100	Fort Worth	TX 76112	A
Burden Brothers, Inc.	P.O. Box 655942	Dallas	TX 75265-5942	A
Burgess & Assoc Mfg Inc	16529 Jersey Dr	Houston	TX 77040	A
Burleson Pipe & Steel, Inc.	Route 5 Box 260P	Fort Worth	TX 76126	A
Burnup & Sims Of Texas	PO Box 340	Austin	TX 78767	B
Business Communications	3220 25th Street	Metairie	TX 70002	A
Business Concepts	5705 Robens Rd	Colleyville	TX 76034	F
Business Equipment of	2525 West Bellfort Suite 105	Houston	TX 77054	M
Business Interiors	PO Box 1167	Arlington	TX 76004	B

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FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Business Software	5050 Quorum Dr Ste 700	Dallas	TX 75240	A
Business World, Inc.	704 Main Street	Garland	TX 75040	F
Buttery Hardware Co Inc	201 W Main St	Llano	TX 78643	A
BVA Supply Company	P.O. Box 691468	San Antonio	TX 78269-1468	G
BVD Glass Company	6504 Midway Rd	Haltom City	TX 76117	A
Byford Machine-Tool Inc	PO Box 646	Valley Mills	TX 76689	A
Byron Folse Associates,	2275 Westpark Court, Ste. 200	Euless	TX 76040	A
C.A.D.D. Technologies	2708 Lynnwood # 364	Arlington	TX 76013	A
C B Five Welding &	11307 Sherman Ave.	Dallas	TX 75229	A
C & C Refrigeration	1400 Ferris Ave	Waxahachie	TX 75165	A
C C Scientific Products	PO Box 24169	Ft Worth	TX 76124-1169	I
C.C.T.V. Source, Inc.	10859 Shady Trail S. 101	Dallas	TX 75220	A
C.H. Builder	P.O. Box 211684	Bedford	TX 76095	F
C & H Sand And Gravel	3325 N Main St	Cleburne	TX 76031	G
C.I.C.	2517 Fairway Park Drive Suite 200	Houston	TX 77092	A
C.J. Harter & Son	10031 Monroe Drive Suite #310	Dallas	TX 75229	A
C.L. Ray Transportation,	#18 Willow Bend	Mansfield	TX 76063	G
C & L Tool, Die & Machine	Route 7 Box 247	Cleburne	TX 76031	A
C & L Tool, Die & Machine	Route 7 Box 247	Cleburne	TX 76031	A
C Ramirez and Sons Inc	PO Box 1657	Hereford	TX 79045-1657	A
C Ross Communique Inc	14232 Marsh Lane Ste 427	Dallas	TX 75234	F
C. Witt, Inc.	2700 Stemmons Freeway Suite 907E	Dallas	TX 75207	G
C-Power Products, Inc.	2007 Industrial	Rockwall	TX 75087	G
Cable & Connector	200 Union Bower Court 210	Irving	TX 75061	A
Cadd Specialists	PO Box 130263	Tyler	TX 75707	A
CAE/D Systems	1000 Beltine Rd #104	Carrollton	TX 75006	A
CAF Enterprises Inc	1595 Hart St	SouthLake	TX 76092	G
Caffey/Sayers Consulting	1140 Empire Central Suite 550	Dallas	TX 75247	A
Cajun Striping	508 Jessie Lee St	Kemp	TX 75143	A
Cal Communications	P. O. Box 477071	Garland	TX 75047-7071	G
Cal-Tex Enterprises, Inc.	1308 Oak Glen Trail	Arlington	TX 76012	G
Caldwell Design Service,	P.O. Box 910	Caldwell	TX 77836	A
Calibrated Graphics	150 Winding Way	Granbury	TX 76048	G
Callier Auto Supply	3606 Fairmount Pky	Pasadenda	TX 77504-3097	A
Callins & Marks	3737 Broadway Suite 360	San Antonio	TX 78209	G
Caloritech, Inc.	2331 Gus Thomasson #128	Dallas	TX 75228	A
Calverley Air Conditioning	P.O. Box 171737	Arlington	TX 76003	G
Camera II & Associates	304 Oakwood	Hewitt	TX 76643	A
Campbell Business	PO Box 8372	Ft Worth	TX 76124-0372	F
Campos & Associates, A	2777 Irving Blvd Suite D	Dallas	TX 75207	
Campos Engineering, Inc.	7430 Greenville Ave	Dallas	TX 75231	F
Candlelight Cleaning	PO Box 381072	Duncanville	TX 75138	I

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Capehart Enterprises	Box 333	Navarro	TX 75157	A
Capital Commitments, Inc.	18111 Preston Rd Suite 810	Dallas	TX 75252	A
Capital Commitments, Inc.	18111 Preston Rd Suite 810	Dallas	TX 75252	A
Capital Ideas	652 Thad Dr	Irving	TX 75061	F
Carbide Drill & Tool	114 South Ward	Longview	TX 75604	A
Cargill Steel & Wire	5151 Beltine Rd #1212	Dallas	TX 75240	B
Cargo Trailer Sales	11522 Harry Hines Blvd	Dallas	TX 75229	G
Carich Reprographics Inc	412 S Harwood St	Dallas	TX 75201	A
Caring Medical Supply Co	4301 Colonial Ave	Dallas	TX 75215	I
Carl Bentley	2303 35th Street	Galveston	TX 77550	F
Carland B. Whitaker	2129 South Houston School Rd	Lancaster	TX 75146	F
Carlton Bates Co	2300 Moneda	Ft Worth	TX 76117	A
Carol Burke's Design	2909 Cole Avenue, Ste. 120	Dallas	TX 75204	G
Carolyn Shamis Realtors	8235 Douglas #104	Dallas	TX 75225	G
Carpenter Janitorial	1010 North Dallas Ave	Lancaster	TX 75146	G
Carroll & Rogers Inc	3217 Franklin Ave	Waco	TX 76710	A
Carter & Burgess, Inc.	1100 Macon Street	Fort Worth	TX 76102-4570	B
Carter Contracting Inc	Po Box 460772	Garland	TX 75040	I
Carter Contracting, Inc.	P.O. Box 460772	Garland	TX 75046	I
Carter Services	3215 W Pleasant Run	Lancaster	TX 75146	G
Casa Bella	P.O. Box 161614	Austin	TX 78716-1614	F
CasaBella	P.O. Box 161614	Austin	TX 78716-1614	F
Casters Of Dallas Inc	2605 Joe Field Dr	Dallas	TX 75229	A
CB Express Deliveries	PO Box 160931	Irving	TX 75016	I
CCM Engineering	630 N Hwy 67 Ste 200	Cedar Hill	TX 75137	A
CCR & B a Joint Venture	3355 West Alabama Suite 640	Houston	TX 77098	F
CCSSI	5001 Infomart/1950 Stemmons	Dallas	TX 75207	G
CDS Information Services,	11632 Cedar Crest	El Paso	TX 79936	I
Ceco Buildings Div -	13241 Champion Forest Ste 110	Houston	TX 77069	B
Celtic Engineering Inc	460 South Hwy 5	McKinney	TX 75069	A
Centaur Installations	3200 W Pleasant Run Rd Ste 217	Lancaster	TX 75146	A
Center for Government	1400 Woodloch Forest Dr Ste 500	The Woodland	TX 77380	B
Centerline Constructors	3519 W Vickery Ste 203	Ft Worth	TX 76107	A
Central Dynamic	1117 East Mansfield Highway/P.O.	Kennedale	TX 76060	G
Central Freight Lines	PO Box 2638	Waco	TX 76702	B
Central Fuel Injection, Inc.	2405B West Waco Drive	Waco	TX 76707	A
Central Industrial Supply	P.O. Box 531290	Grand Prairie	TX 75053	A
Central Instrument Lab Inc	1738 N Greenville Ave	Richardson	TX 75081	A
Central Instrument Lab Inc	1738 N Greenville Ave	Richardson	TX 75081	A
Central Sprinkler	2020 Century Center Blvd #150	Irving	TX 75062	B
Central Texas Clarklift	5198 South Loop 340	Waco	TX 76706	A
Central Transporation	PO Box 560084/3200 Irving Blvd	Dallas	TX 75356-0084	B

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FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Central Vending Co., Inc.	910 W. Kearney	Mesquite	TX 75159	A
Century Builders Inc	1702 Ojeman	Houston	TX 77055	A
Century Flight Systems,	P.O. Box 610	Mineral Wells	TX 76067	G
Century Flight Systems,	PO Box 610	Mineral Wells	TX 76067	A
Century Technologies, Inc.	4335 Piedras Drive West Suite 130	San Antonio	TX 78228	F
Certified Laboratories	PO Box 152137	Irving	TX 75015	B
Cetech R/D Inc	PO Box 832393	Richardson	TX 75083	A
Champion Electronics	903 W. Cotton St.	Longview	TX 75601	A
Champion Electronics	903 West Cotton	Longview	TX 75604-5544	A
Chandler Signs Inc	9129 Directors Row	Dallas	TX 75247	A
Chaney-Cox Construction	PO Box 1902	Temple	TX 76503	A
Chaparral Electric Supply	P.O. Box 910	Amarillo	TX 79105	A
Chaparral Steel	300 Ward Rd	Midlothian	TX 76065	B
Chapman Office Products	PO Box 654	DeSoto	TX 75115	A
Chapparral Steel	300 Ward Rd	Midlothian	TX 76065	B
Charles D. Gooden	2656 South Loop West Suite 380	Houston	TX 77054	F
Charles F Terry Inc	2601 Gaston Ave	Dallas	TX 75226-1302	A
Charles Gojer &	11615 Forest Central Drive Suite 204	Dallas	TX 75243	F
Charles Neal Security	7251 Bayberry Lane	Dallas	TX 75249	A
Charlie's Pier Hole	724 Heather Knoll	DeSoto	TX 75115	A
Charlie's Pier Hole	724 Heather Knoll	De Soto	TX 75115	G
Charter Builders Inc	10105 W Technology Blvd Suite 100	Dallas	TX 75220	B
Cheif Electric Motor	2205-B Peach Tree Rd	Balch Springs	TX 75180	F
Chem-Lab Circuit	11013 D Market St	Houston	TX 77029	A
Chemco Chemical	P.O. Box 801850	Dallas	TX 75380-1850	A
Chemwaste Services, Inc.	P.O. Box 3492	Port Arthur	TX 77642	F
Chenco, Inc.	2343 Cartwright St.	Dallas	TX 75212	A
Chiang Patel & Associates	8828 Stemmons Freeway Suite 410	Dallas	TX 75247	F
Chickasaw Lumber Co	PO Box 710	Ft Worth	TX 76101	A
Chief Electric Motor	2205-B Peach Tree Rd	Balch Springs	TX 75180	F
Chief Pest Control Inc	PO Box 686	Arlington	TX 76004	G
Childers & Parker	1950 Alpha Dr Suite 400	Rockwall	TX 75087	G
Choctaw Environmental	P.O. Box 153409	Irving	TX 75015-3409	I
Chow's Custom Catering	1514 Bowers Rd	Seagoville	TX 75159	F
Chris Evans	7510 Robin Rd	Dallas	TX 75209	F
Christina M. Winters	3716 Santiago Court	Las Colinas-	TX 75062	G
Christine Corporation	7502 Greenville Ave Ste 500	Dallas	TX 75231	G
Christine Corporation	7502 Greenville Ave Suite 500	Dallas	TX 75231	I
Christofferson Commerical	854 Glenville Drive	Richardson	TX 75081	A
Christofferson Commerical	854 Glenville Drive	Richardson	TX 75081	A
Chuck Fairbanks	1003 N Dallas	Lancaster	TX 75146	A
CIA Machinery, Inc.	P.O. Box 763670	Dallas	TX 75376-3570	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Ciber, Inc.	2121 San Jacinto Tower Suite 1960	Dallas	TX 75201	A
Cierra Pipe, Inc.	P.O. Box 35775	Houston	TX 77235	A
Circle W. Supply Co.	P.0. Box 551	Jacksonville	TX 75766	A
Circuit Systems Company,	P.O. Box 171322	Arlington	TX 76003-1322	I
Cisco Lumber,& Supply	P.O. Box 1587	Cisco	TX 76437	A
Cisco Material Handling	1220 Century Dr.	Carrollton	TX 75006	A
Cita Technologies /	5624 Green Oaks Blvd. S.W.	Arlington	TX 76017	G
City Color	135o Manufacturing Ste 123	Dallas	TX 75207	F
City Lights Instant Photos	1706 Acorn	Euless	TX 76039	I
City Office Supply	P.O. Box 1201	Corsicana	TX 75151	A
Civil Engineering	9901 Broadway Suite 114	San Antonio	TX 78217-4919	A
CKA Enterprises, Inc.	611 Ryan Plaza Drive Suite 700	Arlington	TX 76011	G
Claire Crabb	509 Ferris Ave	Waxahachie	TX 75165	G
Clarke & Courts	P.O. Box 1529	Dallas	TX 75221	A
Class Act Printing And	1133 N Zang Ste 109	Dallas	TX 75203	I
Clayton P. Smith	P.O. Box 252	Godley	TX 76044	A
Cleaning Solutions	4109 Miller Park	Garland	TX 75042	F
Clearwater Constructors	3050 Regent Blvd Suite 230	Irving	TX 75063	B
Cleburne Electric	P.O. Box 163	Cleburne	TX 76033	G
Cleburne Micrographic	P.O. Box 95	Cleburne	TX 76033-0095	A
Cleburne Micrographics,	810 S. Old Betsy Rd	Keene	TX 76059	A
Clemons Trucking Co	7934 S Lancaster Td	Dallas	TX 75241	F
Cliff Esterday Fencing	Po Box 374	Kennedale	TX 76060	A
CLM Automotive	2809 Ivanridge Lane	Garland	TX 75044	I
Cloud Contruction Co Inc	PO Box 667	Temple Bell	TX 76503	A
Clowe & Cowan Inc	Po Box 32430	Amarillo	TX 79185-0001	A
CMT Machine Tools, Inc.	1215 Executive Dr West Suite 108	Richardson	TX 75081	A
CO 2 Inc	101 East County Rd 120 Ste 204	Midland	TX 79705	A
Coastal Alloys Inc	8404 Endicott Lane	Dallas	TX 75227	G
Coburn Supply Co Inc	1000 Bowie/PO Box 3526	Beaumont	TX 77704	B
Coca-Cola Bottling	6011 Lemmon Ave/PO Box 2008	Dallas	TX 75221	B
Cockrell Printing Company	301 Galveston	Fort Worth	TX 76104	A
Cody Air Conditioning Inc	6041 S Lamar St	Dallas	TX 75215	A
Codycole Protection Inc	4411 Old Bullard Rd Suite 200	Tyler	TX 75703	A
Cohn & Gregory Inc	PO Box 7419	Ft Worth	TX 76111	A
Coleman & Associates Inc	4054 McKinney Ste 201	Dallas	TX 75204	F
Collins Cabinets	1103 Cedar Run Dr	Duncanville	TX 75137	A
Collins Window Cleaning	P.O. Box 15474	Fort Worth	TX 76119	A
Collinsystems Corporation	2100 N Hwy 360 Ste 405-A	Grand Prairie	TX 75050	A
Color Dynamics Inc	150E Bethany Rd	Allen	TX 75002	B
Colorfast Photos	847 N. Hampton	DeSoto	TX 75115	F
Colortek Inc	125 East Tenth	Dallas	TX 75203	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Comfort Inn	1601 E. Division Street	Arlington	TX 76011	B
Commercial Cleaning &	7245 Hidden Valley	Beaumont	TX 77708	A
Commercial Equipment	PO Box 15710	San Antonio	TX 78212	A
Commercial Ment, Inc.	P.O. Box 29619	Dallas	TX 75229	B
Commercial Pantex Sika	2655 Villa Creek Dr Ste 299	Dallas	TX 75234	A
Commerical Pantex Sika,	555 Republic Drive Suite 200	Plano	TX 75074	B
Commerical Tool &	P.O. Box 568568	Dallas	TX 75356	A
Communications Brokers,	1233 E. Pleasant Run Rd.	DeSoto	TX 75115	F
Communications	P.O. Box 120861	Arlington	TX 76012	A
Communications	1300 Summit Suite 516	Ft Worth	TX 76102	G
CommuniQuest, Inc.	1825 East Plano Parkway Suite 230	Plano	TX 75074	G
Community Video	4500 W Davis	Dallas	TX 75211	A
Compro Computer	122 West Carpenter Freeway Suite	Irving	TX 75039	M
Compu ADD Corporation	2707 Realty Dr	Carrollton	TX 75006	B
Compu Supplies &	4215 Beltwood Pkwy #107	Dallas	TX 75244	F
CompuRoute Inc	2701 National Place	Garland	TX 75041	A
CompuSite, Inc.	8080 North Central Expressway Suite	Dallas	TX 75206-1811	F
Computer Assistance	2711 LBJ Freeway Suite 312	Dallas	TX 75234	B
Computer Bay Inc	7320 S W Frwy #114	Houston	TX 77074	F
Computer Controls, Inc.	4303 N. Central Expressway	Dallas	TX 75205	F
Computer Controls, Inc.	4303 North Central Expressway	Dallas	TX 75205	F
Computer Data Systems	5929 Springtide Dr.	Ft. Worth	TX 76135	A
Computer Help	2727 Oak Lawn Ste 206	Dallas	TX 75219	I
Computer Maintenance	2460 Southwell Road	Dallas	TX 75229	A
Computer Movers	4015 Cresthill; Suite # 8	Dallas	TX 75227	A
Computer Peripheral	1201 East 15th Street #305	Plano	TX 75074	G
Computer Programming	2509 Miller Lane Suite C	Arlington	TX 76013	A
Computer Solutions	2921 Brown Trail, Ste. 130	Bedford	TX 76021	A
Computer Supplies &	4215 Beltwood Pkwy #107	Dallas	TX 75244	F
Computer Systems Access	2009 Aliso Rd.	Plano	TX 75074	G
Computer Systems Access	2009 Aliso Rd	Plano	TX 75074	G
Computer Visions, Inc.	900 Copeland Rd East #120	Arlington	TX 76011	A
Computerbay	7320 SW Freeway #114	Houston	TX 77074	F
Computerized Business	4405 Thousand Oaks Drive	Arlington	TX 76017	G
Computerized Business	4216 Langley Lane	Irving	TX 75038	G
Computex Support	1845 Summit Ave Ste 409	Plano	TX 75074	A
ComSoft Management	9800 Richmond Ave Ste 560	Houston	TX 77042	F
Comtex Company Inc	101 S College	Waxahachie	TX 75165	A
Con Pac 3	2807 Lovers Ln.	Dallas	TX 75225	A
Con-Way Southwest	14500 Trinity Blvd Suite 118	Fort Worth	TX 76155	B
Concepts 3, Inc.	3017 Medlin Dr, Ste. C	Arlington	TX 76015	G
Concrete Finishers	4725 Kristie Dr	Balch Springs	TX 75180	F

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Condry Cayton Burford &	PO Box 180507	Dallas	TX 75218	A
Conex Construction Inc	PO Box 429	Round Rock	TX 78680	A
Conley Lott Nichols	PO Box 660236	Dallas	TX 75266-0236	A
Connec-Tek Inc	1525 Crescent Circle #115	Carrollton	TX 75006	A
Connect Systems Inc	4111 Hwy 80 Ste 204	Mesquite	TX 75150	G
Consolidated Electrical	P.O. Box 59328	Dallas	TX 75229	B
Construction Cost	2413 N Main St	Ft Worth	TX 76106	A
Construction Inspection	224 N Elm St	Lancaster	TX 75146	A
Consultants & Designers	1111 W Mockingbird Ln Ste 1100	Dallas	TX 75247	B
Containment	1908 North Memorial Way	Houston	TX 77007	B
Contel Of Texas	10300 N Central Expwy	Dallas	TX 75367-9003	B
Conteol Of Texas Inc	PO Box 679003	Dallas	TX 75367-9003	B
Continental Builders	605 East Berry Street Suite 104	Fort Worth	TX 76110	F
Continental Water	2125 109th Street	Grand Prairie	TX 75050	A
Contract Inspection	4233 Young St	Pasadena	TX 77504	G
Contractor Glass & Mirror	1611 E 27	Amarillo	TX 79103	A
Contractors Electric	2803 Dairy Milk Ln	Dallas	TX 75229	A
Control Devices Inc	12010 Forestgate Dr	Dallas	TX 75243	A
Control Systems	1625 W Crosby Rd Ste 100	Carrollton	TX 75006	B
Convention & Meeting	9210 Markville	Dallas	TX 75243	G
Convex Computer	15851 Dallas Parkway #640	Dallas	TX 75248	B
Cook Consultants Inc	12201 Merit Dr Ste 700	Dallas	TX 75251	A
Cook Paint and Varnish	16420 West Hardy	Houston	TX 77060	B
Cooper Power Systems	P.O. Box 92851	Grapevine	TX 76051	B
Copano Services Inc	PO Box 1024	Sugar Land	TX 77487	A
Copeland Concrete	828 Stella Ave	Dallas	TX 75216	F
Copes Vulcan c/o Pepsco	PO Box 690807	Houston	TX 77269-0807	B
Cornwall Industries, Inc.	P.O. Box 26956	Fort Worth	TX 76126	A
Corphealth, Inc.	1300 Summit Ave Suite 626	Fort Worth	TX 76102	A
Corporate Awards, Inc.	4410 Beltway	Dallas	TX 75244	A
Corporate Interiors Inc	2325 Piedra Dr	Plano	TX 75023	G
Corporate Systems	1212 Ross St/PO Box 31780	Amarillo	TX 79120	B
Corporate Travel	5205 N O'Connor Suite 110	Irving	TX 75039	N
Corr Tech, inc.	11569 Goodnight Lane	Dallas	TX 77529	A
Corrpro Companies Inc	PO Box 100	Spring	TX 77303	A
Corrpro Companies, Inc.	P.O. Box 100	Spring	TX 77383	B
Corsicana Sign & Crane	P.O. Box 2241	Corsicana	TX 75151	A
Corsicana Welding Supply	2151 E. Highway 31	Corsicana	TX 75110	G
Corsicana Welding Supply	2151 East Highway 31	Corsicana	TX 75110	G
Cort Furniture Rental	14040 Welch Rd	Dallas	TX 75234	Fu
Cortest Labortories, Inc.	11115 Mills Road Suite 102	Cypress	TX 77429	A
Cosmopolitan	P.O. Box 27792	San Antonio	TX 78227-0792	F

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Cowboy Coring	7501 Hwy 287 S. Bldg E, Suite 1	Arlington	TX 76017	A
Cox Office Supply	1501 South Akard	Dallas	TX 75215	A
Coyote Electronics, Inc.	4701 Old Denton Rd	Haltom City	TX 76117	G
Craig Communications	1901 Royal Ln #102	Dallas	TX 75229	G
Cramar Enterprises, Inc.	15064 Beltway Suite #119	Dallas	TX 75244	F
Craven Associates Inc	946 Dalworth St	Mesquite	TX 75149	A
Crawford Utility Contractor	PO Box 579	Rockwall	TX 75087	A
Creations III	5711 Overridge Court	Arlington	TX 76017	G
Creative Office Systems	1100 N Luke St	Irving	TX 75061	A
Creative Staff	PO Box 1569	Burleson	TX 76028	A
Crete Contractors	3055 Medlin Drive	Arlington	TX 76015	A
Crossland Tools	1448 Halsey Way S 114	Carrollton	TX 75007	G
Crown Supply Co	515 E 10th St	Borger	TX 79008-5198	A
Cryterior Systems Inc	PO Box 4096	Dallas	TX 75208	A
CSC Disposal & Landfill	PO Box 438/ Powell St	Avalon	TX 76623	A
CSR Contracting, Inc.	P.O. Box 288	Helotes	TX 78023	F
CSS Construction	9412 Pinehaven Dr	Dallas	TX 75227	G
Culp Consulting	3705 Green Oaks Blvd West	Arlington	TX 76016	A
Cummins-Allison Corp	13721 Gramma Rd	Dallas	TX 75244	A
Cura Inc	2209 Wisconsin St Ste 400	Dallas	TX 75229	A
Currie Industrial	5104 Palo Alto Drive	Garland	TX 75043	F
Curtin Matheson Scientific	2110 Hutton Ste 1000	Carrollton	TX 75006	B
Cushman & Wakefield Of	5430 LBJ Freeway Ste 1100	Dallas	TX 75240	B
Custom Coffee	722 Ave H East	Arlington	TX 76011	B
Custom Controls	6320 Alder St	Houston	TX 77081	A
Custom Design	321 Chamnber Creed Drive	Everman	TX 76140	G
Custom Precision Sheet	9810 B Fairbanks/N Houston Rd	Houston	TX 77064	F
Custom Programming	14875 Landmark Blvd Suite 204	Dallas	TX 75240	F
Cutler Williams, Inc.	4000 McEwen South Suite 200	Dallas	TX 75244	A
CW Systems, Inc.	14643 Dallas Parkway Suite 525	Dallas	TX 75240	B
Cyclone Aluminium and	P.0. Box 1408	Azle	TX 76020	A
Czech Irrigation	Rt #1 Box 193	Ennis	TX 75119	A
D. Alexander & Associates	8080 North Central Expressway Suite	Dallas	TX 75206	F
D & C Distributing Inc.	209 Laguna Vista, Sp. Trl.	Granbury	TX 76048	A
D C Strong Pres/CEO	P.O. Box 300398	Arlington	TX 76010	F
D E Shipp Belting	PO Box 20035	Waco	TX 76702	A
D & J General Contractors	4200 Boston Ste 15	Lubbock	TX 79413	A
D & K Services	1222 Commerce Ste 017	Dallas	TX 75202	A
D M & H Inc	PO Box 610007/1915 Peters Rd	Irving	TX 75061	A
D.R. Joseph, Inc.	700 Highlander Blvd Suite 150	Arlington	TX 76015	A
D Watts Hauling	Po Box 673	Hutchins	TX 75141	F
D-C Tool Co	6729 Bridge Street	Ft Worth	TX 76112	I

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Dabster, Inc.	2500 Tanglewilde Suite 495	Houston	TX 77063	A
Dahl Braden PTM Inc	3500 Maple Ave LB -87 Suite 1100	Dallas	TX 75219	A
DAL-MATIC, Inc.	P.O. Box 227355	Dallas	TX 75222	A
Dal-Tex Acoustics, Inc.	2727 Viva Dr	Mesquite	TX 75150	G
Dallas Compressor	13717 Neutron Road	Dallas	TX 75244	A
Dallas Compressor	13717 Neutron Road	Dallas	TX 75244	A
Dallas Digital Corporation	624 Krona Suite 160	Plano	TX 75074	A
Dallas Electric Co Inc	510 N Ravinia Dr	Dallas	TX 75211	A
Dallas Ford New-Holland	2525 Irving Blvd	Dallas	TX 75207	A
Dallas Market Center	2100 Stemmons Frwy #160	Dallas	TX 75207	B
Dallas Paper & Packaging	9319 LBJ Fwy. Suite 118	Dallas	TX 75243	F
Dallas Photolab	3942 Irving Blvd	Dallas	TX 75247	A
Dallas Softstore and P.C.'s	2101 Midway Rd #200	Carroltton	TX 75006	A
Dallas Welding Supply	3880 Irving Blvd	Dallas	TX 75247	A
Daltex Masonry	Box 140801	Dallas	TX 75214-0801	A
Dalton, Inc.	512 Prairie Street	Arlington	TX 76011	F
Dalworth Concrete	1111 111th St	Arlington	TX 76011	B
Dalworth Tool & Supply,	637 107th Street	Arlington	TX 76011	A
Damark Service Company	2324-B Ridgepoint Drive	Austin	TX 78754	G
Dan Dipert Travel	Box 580, 709 W. Abram	Arlington	TX 76004	B
Danco Supply Company	1302 Scenic Drive	Longview	TX 75604	I
Dandoi Enterprises, Inc.	607 South Main	Highlands	TX 77562	G
Daniel Industries, Inc.	P.O. Box 19097	Houston	TX 77224	B
Dantack Corporation	2521 Dalworth	Grand Prairie	TX 75050	G
Darlene Davis M.A.	5909 Luther Lane #1600	Dallas	TX 75225	G
Darrell Crass Drilling	P.O Box 5383	Midland	TX 78702	A
Data Documents	601 IH 45 South	Hutchins	TX 75141	B
Data Documents	510 North Valley Mills Drive Suite 304	Waco	TX 76710	B
Data Documents	510 North Valley Mills Dr Suite 304	Waco	TX 76710	B
Data Images	PO Box 382483	Duncanville	TX 75138-2483	G
Data Index Incorp	9400 N Central Expwy Ste 314	Dallas	TX 75231	A
Data Index Incorporated	9400 North Central Expy Ste 314	Dallas	TX 75231	A
Data Marketing	14235 Proton Road	Dallas	TX 75244	A
DataCap Manufacturing	139 Mantlebrook Dr	DeSoto	TX 75115	F
DataCom Cable	11010 Switzer Ave Ste 104	Dallas	TX 75238	A
DataCom Cable	11010 Switzer Ave Ste 104	Dallas	TX 75238	A
DataStor Corporation	2225 East Randoll Mill Rd	Arlington	TX 76011	F
Datatech Services	14850 Quorum Dr Ste 425	Dallas	TX 75240	A
Datatex Computer Corp	4315 Penrod Ave	Dallas	TX 75211	A
Datatex Computer	4315 Penrod Ave/PO Box 210737	Dallas	TX 754211	A
DataTrend Systems, Inc.	1950 Stemmons Frwy. Ste. 5001	Dallas	TX 75207	G
Datronics Management Inc	17304 Preston Rd #590	Dallas	TX 75252	B

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Datum Engineering Inc	6516 Forest Park Rd	Dallas	TX 75235	A
Dave Riddle Electric Co	1510 Randolph #608	Carrollton	TX 75006	A
David C. Spindor	2806 Azle Ave	Fort Worth	TX 76106	F
David E. Taylor	122 S. 12th., Suite 101	Corsicana	TX 75110	A
David Gillespie &	3400 Carlisle Ste 410	Dallas	TX 75204	A
David K Bulla &	4817 Hollowbrook Rd	Ft Worth	TX 76103	A
David I Brayton Trucking	412 Walnut	Duncanville	TX 75116	I
David Lynn Machine, Inc.	119 South Town East Blvd	Mesquite	TX 75149	A
David Somers &	318 E Main St	Richardson	TX 75081	A
David & Susan Bethards	1609 South Main	Cleburne	TX 76031	B
David's Welding Service	401 W Madison	Waxahachie	TX 75165	A
Davis Motor Crane	1222 N Loop 12	Irving	TX 75061	A
DC Welding Service	Box 1501	Denver City	TX 79323	A
Dealer Products Inc	2220 Regal Parkway	Euless	TX 76039	A
Dealers Electrical Supply	111 Explorer	Duncanville	TX 75138	A
Dean Weir	Route 2 Box 72D Daniels Rd	Waxahachie	TX 75165	A
Debra K. Davis	413 S. Locust	Mesquite	TX 75149	G
Defense Technology, A	3909 Hulen, Suite 300	Ft. Worth	TX 76107	A
Defense Technology, A	3909 Hulen Suite 300	Fort Worth	TX 76107	A
Deford Lumber Co Icn	PO Box 380580	Duncanville	TX 75138	A
Del Mar Scientific/dba	P.O. Box 486	Addison	TX 75001	A
DeLaTorre Sheet Metal	9110 Premier Row	Dallas	TX 75247	F
Delta Fabrication &	P.O. Box 980	Daingerfield	TX 75638	M
Delta Petroleum Products,	1114 West Oakdale	Grand Prairie	TX 75050	A
Demopulos and Ferguson	6116 N Central Expressway Suite	Dallas	TX 75206	B
Demopulos and Ferguson,	6116 North Central Expressway Suite	Dallas	TX 75206	A
Denton Brothers Trucking	P.O. Box 197	Collinsville	TX 76233	A
Denton Brothers Trucking	P.O. Box 207	Collinsville	TX 76233	A
Denton Wolter & Com	5550 LBJ Fwy Ste 220	Dallas	TX 75240	G
Des Con, Inc.	111 Ferguson Court Suite 106	Irving	TX 75062	F
Des Con Inc	111 Ferguson St #106	Irving	TX 75062-7014	F
DeShazo Starek & Tang	330 Union Station	Dallas	TX 75202	B
Designing Woman Florist	621 North Hampton	De Soto	TX 75115	G
Desktop Technologies	113 W. Park Row Dr.	Arlington	TX 76010	G
DeSoto Janitorial Supply,	719 S. Beckley	DeSoto	TX 75115	A
Detrex	322 International Parkway	Arlington	TX 76011	A
Devco Industries dba	P O Box 151045	Arlington	TX 76015	A
Devices Inc	PO Box 835338	Richardson	TX 75083-5338	A
DeVille Enterprises, Inc.	102 W. Fairmeadows	Duncanville	TX 75116	B
DeWeese Crawford &	1504 Osprey Suite B	DeSoto	TX 75115	A
Dezine Media	845 East Arapaho Ste 114	Richardson	TX 75081	I
DFW Business	1825 Summit Ave Ste 201	Plano	TX 75074	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
DFW Image Systems	3410 Midcourt #119	Carrollton	TX 75006	A
DFW Leasing	1400 Brown Trail Suite C	Bedford	TX 76022	G
DFW Movers & Erectors,	10661 Newkirk Street	Dallas	TX 75220	A
DGK Inc dba The	2701 A Fondren #127	Dallas	TX 75206	N
Di Sciullo & Terry, Inc.	P.O. Box 506	Arlington	TX 76004	A
Dialight Corp	9858 Plano Rd Suite 100	Dallas	TX 75238	B
Diamond Office Supply	901 Plano Pkwy #101	Plano	TX 75074	G
Diaz-Garcia Enterprises	7848 Kermit Ave	Ft Worth	TX 76116	I
Dictaphone Corporation	13749 Newtron Rd Ste 200	Dallas	TX 75244	B
Diesel Specialty Service	209 N Ebrite	Mesquite	TX 75149	A
Digital Network, Inc.	10935 Estate Lane Suite 440	Dallas	TX 75238	A
Digital Planners	1903 Marlock	Pasadena	TX 77502	B
Dikita Engineering	8200 Brookriver Drive Suite 612	Dallas	TX 75247	F
Dilley Manufacturing	9716 Trail Hill Drive	Dallas	TX 75238	B
Dimension/3	9780 Westview	Houston	TX 77055	A
Direct Computers Plano	2901 North Central Expressway #117	Plano	TX 75075	G
Disco Print Co.	1333 Industrial Blvd.	Sugarland	TX 77478	A
Dittmar Lumber Corp.	P.O. Box 831	San Antonio	TX 78293	A
Diversified Insurance	1039 Stemmons Frwy Ste 306	Carrollton	TX 75006	A
Diversified Interstate Inc	Rt 3 Box 44	Farmersville	TX 75031	A
Diversified Interstate Inc	Rt 3 Box 44	Farmersville	TX 75031	G
Diversified Temporaries,	1097 Elm Street Suite 1800	Dallas	TX 75201	I
Dixon & Neuville, P.C.	101 West Pearl Street	Granbury	TX 76048	A
Doc Holliday's Discount	1301 W. Henderson	Cleburne	TX 76031	A
Dodge/Reliance Electric	13740 Midway Rd Suite 800	Dallas	TX 75244-4370	B
Don Herring Mitsubishi	3312 Marvin D Love Frwy	Dallas	TX 75224	A
Don Malone Design	2500 State St	Dallas	TX 75201	A
Don Miller Dump Truck	Route 1 Box 271	Odessa	TX 79765	A
Donald C. Moreau P.E.	8585 Stemmons Freeway Suite 645	Dallas	TX 75247	A
Donna Vaughan &	500 N Akard Suite 3800	Dallas	TX 75201	G
Dormier Printing & Office	2900 B Denton Highway	Fort Worth	TX 76117	G
Double D Fasteners	4455 Mint Way	Dallas	TX 75236	G
Double L. Contracting	6102 E. Mockingbird Suite 373	Dallas	TX 75214	A
Double L Systems	6102 E Mockingbird Ste 352	Dallas	TX 75214	A
Doucette Industries	2311 Gus Thomasson #128	Dallas	TX 75228	A
Douglas Harding Group	3040 Post Oak Blvd Suite 510	Houston	TX 77056	A
Douglas R. Doering	2610 Catherine Street	Dallas	TX 75211	A
Douglas W Ratcliff	PO Box 693	Waxahachie	TX 75165	A
Dr Pepper Bottling	Po Box 655024	Dallas	TX 75265	B
Drake Communications	2155 Chennault Dr Ste 310	Carrollton	TX 75006	A
Dralco, Inc.	2102 N. Main St.	Weatherford	TX 76086	A
Drilex Corporation	P.O. Box 60440	Houston	TX 77205	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
DSE Inc	2805 Market St #187	Garland	TX 75041	B
Duane Smith	404 South Fryers Creek Suite 716	Temple	TX 76504	A
Dudley, Bailey, Jezek &	P.O. Box 2007	Waco	TX 76702	A
Dugger Brother, Inc.	505 S. Caddo	Cleburne	TX 76031	A
Dumas Printing Company	Box 907, 117 West 7th	Dumas	TX 79029-0907	A
Duncan Truck Sales	3333 South I.H. 35	Waco	TX 76706	A
Duncanville Travel	207 S Cedar Ridge	Duncanville	TX 75116	A
Dunkel Marine Products	P.O. Box 35353	Houston	TX 77235-5353	G
Durable Medical	2000 South Beckley	Dallas	TX 75224	F
Durable Specialties Inc	PO Box 381788	Duncanville	TX 75138	A
Durant Chevrolet, Inc.	1909 Hwy 377 E	Granbury	TX 76048	A
Durbin Data Systems	132 E First St	Lancaster	TX 75146	A
Dykeman Associates Inc	4115 Rawlins	Dallas	TX 75219-3661	G
Dynamic Cable Const Co	Rt 3 Box 3253	Ben Wheeler	TX 75754	F
Dynamic Communications	1414 Lincoln Drive	Carrollton	TX 75006	G
Dynamic Database	4004 Beltline Rd. , Suite 107, LB4	Dallas	TX 75244	G
Dynamic Sources, Inc.	12005 Ford Rd Suite 610	Dallas	TX 75234	F
Dynamic Sources, Inc.	12005 Ford Road Suite 610	Dallas	TX 75234	F
E & C Group International,	P.O. Box 680688	Houston	TX 77268-0688	A
E & C Precision Fab Co	6061 Thomas Rd	Houston	TX 77041	A
E C Tool & Supply Co	PO Box 1286	Abilene	TX 79604	A
E D P Resources	PO Box 40254	Houston	TX 77240-0254	I
E H Teasley & Co Inc	PO Box 515	Dallas	TX 75221	A
E & I Cooperative Service	14114 Dallas Parkway Suite 550	Dallas	TX 75240	B
E L Lester & Company	PO Drawer 14169	Houston	TX 77221	A
E.M. Kendall	12680 Noel #1062	Dallas	TX 75230	no
E Robertson and	PO Box 836141	Richardson	TX 75083	B
E.S.I. Electric, Inc.	10514 Woodedge	Houston	TX 77070	B
E T Jones and Associates	5080 Spectrum Dr Ste 615 E	Dallas	TX 75248	A
E-Z Products	610 East Kenneth Ave	Spearman	TX 79081	A
Eagle 5000	702 Pauline St.	Euless	TX 76040	G
Eagle Excavating &	2115 West Mockingbird	Dallas	TX 75235	F
Eagle Express, Inc.	P.O. Box 59972	Dallas	TX 75229	A
Eagle Security	#8 Spur Drive	Belton	TX 76513	A
Eaglequit Enterprises Inc	Rt 1 Box 755	Bandera	TX 78003	A
Earle Industries, Inc.	P.O. Box 914	Belton	TX 76513	A
East Texas Maintenance	905 Rushwood Dr	Lufkin	TX 75901	F
Easter & Sons Supply Co	10770 Turbeville Dr	Dallas	TX 75243	A
Eastman Kodak Co	5221 N O'Connor Blvd	Irving	TX 75039	B
Eastman Photography	8214 Meadow Rd #124	Dallas	TX 75231	F
Ecco Chemicals, Inc.	8505 Directors Row	Dallas	TX 75247	A
Ecco Chemicals, Inc.	8505 Directors Row	Dallas	TX 75247	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Ecology Systems Inc	3109 Louise Ave	Ft Worth	TX 76112	A
Econo Lodge	795 South I.H. 35E	Waxahachie	TX 75165	A
Economic Resources	PO Box 40254	Houston	TX 77240-0254	I
EDC Moving Systems	1232 Crowley Rd Suite B	Carrollton	TX 75006	B
Eddie B. Gilley	5816 Myers Drive	Arlington	TX 76017	G
Edonar, Inc. dba Seguin	7050 Business Highway 123 South	Seguin	TX 78155	A
EDP Resources	PO Box 40254	Houston	TX 77240-0254	I
EDS Technical Products	1800 Jay Ell Dr	Richardson	TX 75081	B
Educational Consultants,	1228 Trailwood	Hurst	TX 76053	G
Educational Equipment	4006 Live Oak Street	Dallas	TX 75204	
Edwards and Patterson	4733 Don Drive	Dallas	TX 75247	A
EFI Communications	6309 North O'Connor Rd Lock Box 14	Irving	TX 75039	A
Eileen H. Young/Thomas'	P.O. Box 117990	Carrollton	TX 75011	G
El-most Productions	P.O. Box 41291	Dallas	TX 75241	F
El-Tec Sales, Inc.	P.O. Box 76054	Hurst	TX 76054	A
Electro Engrg	9858 Plano Rd Suite 100	Dallas	TX 75238	A
Electro Rent Corp.	12051 Forestgate Dr.	Dallas	TX 75243	B
Electro - Static Refinishers,	119 Carder Street	Duncanville	TX 75116	A
Electronic Assistance	P.O. Box 2086	Temple	TX 76503	G
Electronic Protection &	6969 Boulder Dr Suite 300	Dallas	TX 75237	F
Electronic Transport Corp	908 N Bowser Rd	Richardson	TX 75081	A
Electronstatic On-Site	2122 Country Club Ste 120	Carrollton	TX 75006	A
Electrotech Systems, Inc.	P.O. Box 10	Grapevine	TX 7605-0010	A
Elgin B Robertson Inc	PO Box 210519	Dallas	TX 75211	A
Elizabeth Iron	Rt. 4 Box 824	Alavarado	TX 76009	G
Elizondo Electronic	2523 West Dickson Suite B	Fort Worth	TX 76110	F
Elliott Electric Supply Co	10990 Petal St	Dallas	TX 75238	A
Elliott Electric Supply Inc	2500 E Randol Mill #105	Arlington	TX 76011	B
Ellis Air Conditioning &	536 N Hwy 67	Cedar Hill	TX 75104	A
Ellis County Medical	601 So Clay Ste 101	Ennis	TX 75119	A
Elmore Drywall &	1805 17th NE	Paris	TX 75460-2829	F
Embee Corporation	4530 W. 34th St., Suite D	Houston	TX 77092	A
Emerald Knights dba	P.O. Box 742015	Dallas	TX 75374-2015	A
Emerson Construction Co	PO Box 1777	Temple	TX 76503	G
Eneract Management	550 Bailey Ste 220	Ft Worth	TX 76107	A
Energy Resource	1025 Tanglewood	Cedar Hill	TX 75104	G
Engercon Group Inc.	1266 E Ledbetter Ste J	Dallas	TX 75216-6999	F
Engercon Group Inc	1266 E Ledbetter Suite 5	Dallas	TX 75216-6999	F
Engineered Computer	10777 Sanden Rd	Dallas	TX 75238	A
Engineers & Erectors, Inc.	P.O. Box 706	Allen	TX 75002	A
England Tires, Wheels,	2118 East Serv. Rd., I - 35	Red Oak	TX 75154	A
Engleman Engineers, Inc.	213 So. Lamar, Suite 104	Austin	TX 78704	A

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FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
English & Associates	P.O. Box 16331, 5624 Wonder Drive	Fort Worth	TX 76133	C
Ennis Office Supply and	204 W Knox St	Ennis	TX 75119	G
Ennis True Value	1203 W Ennis Ave	Ennis	TX 75119	A
Enrique Mendez	PO Box 626	Ft Worth	TX 76101	A
Entech, Inc.	P.O. Box 612246	DFW Airport	TX 75261	A
EnterChange, Inc.	1750 One Galleria Towers LB 61	Dallas	TX 75240	A
Enterprise Advisory	6671 Southwest Frwy Ste 401	Houston	TX 77074	F
Entre Computer Center	5201 Sanger Ave	Waco	TX 76710	A
Entre Computer Center	5201 Sanger Ave	Waco	TX 76710	A
Entre Computer Center	11221 Katy Fwy #112	Houston	TX 77079	A
EPI Technologies, Inc.	1331 N. Plano Road	Richardson	TX 75081	A
Epsilon Engineering, Inc.	1250 West Sam Houston South	Houston	TX 77042	F
Equifax	PO Box 833810	Richardson	TX 75083-3810	B
ERCO Energy Resources	1776 Woodstead Suite 200	The Woodlands	TX 77380	A
Ergonomic Office	P.O. Box 871591	Dallas	TX 75287-1591	F
Ernie Graves Company Inc	1701 North Greenville Ave #503	Richardson	TX 75081	A
Errands Unlimited	PO Box 2904	Waxahachie	TX 75165	G
Escargot Designs Ltd.	837 Barkridge Trail	Burleson	TX 76028	G
Esco Inc	PO Box 36445	Houston	TX 77036	A
Escondido Construction,	6600 Westwind	El Paso	TX 79912	F
ESSIET & Associates	P.O. Box 100847	Fort Worth	TX 76109	A
ETA Technologies	2700 North East Loop 410 Suite 450	San Antonio	TX 78217	F
ETA Technologies	2700 North East Loop 410 Suite 450	San Antonio	TX 78217	F
ETD Tri-County Waste Oil	309 Kirven	Waxahachie	TX 75165	A
ETN. Inc.	P.O. Box 380937	Duncanville	TX 75138	G
Eubank Mfg Enterprises	PO Box 7938	Longview	TX 75607	A
Eugene W McWhorter	2008 Sunshine Square	Longview	TX 75601	A
Eureka Ready Mix Inc	Rt 6 8000 S Hwy 287	Corsicana	TX 75110	A
Evaluation Associates	12700 Hillcrest Rd., Suite 155	Dallas	TX 75230	A
Evans Supply Co	1600 109th ST	Grand Prairie	TX 75050	I
Everage, Smith, Farrington	2630 W. Freeway Suite 100	Fort Worth	TX 76102	A
Evox/Rifa International	9858 Plano Rd Suite 100	Dallas	TX 75238	A
Excell Machine Co Inc	602 South Fourth Ave	Mansfield	TX 76063	A
Excell Machine Comapny,	602 S. Fourth Avenue	Mansfield	TX 76063	A
Excell Machine Company,	602 S. Fourth Avenue	Mansfield	TX 76063	A
Executech Marketing	2414 McKensie Lane	Grand Prairie	TX 75052	F
Executive Airlift	5801 Marvin D. Love Frwy Suite 103	Dallas	TX 75237	G
Executive	P.O. Box 60014	Fort Worth	TX 76115	G
Executive Incentives	132 W. Second Street	Irving	TX 75060	G
Executive Properties Inc	115 Executive Way	DeSoto	TX 75115	G
Executive Security	1111 North Loop West Suite 710	Houston	TX 77008	F
Exide Corporation	11420 Ferrell Dr Suite 300	Dallas	TX 75234	B

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FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Expert Net Corporation	11311 N Central Expwy #300	Dallas	TX 75243	A
ExpertNet Corporation	11311 N Central Expwy #300	Dallas	TX 75243	A
Express Air Drilling, Inc.	1525 Two Turtle Creek Village	Dallas	TX 75219	A
Express Concrete Co	6100 Old Hemphill Rd	Ft Worth	TX 76134	A
Express Sixty-Minute	101 S Jennings ste 103	Ft Worth	TX 76104	G
Exxon Company, U.S.A.	P.O. Box 541207	Dallas	TX 75354	B
F and S Manufacturing Co	232 Commercial St	Garland	TX 75040	F
F. Brown and Associates	5420 LBJ Freeway Suite 100	Dallas	TX 75240	A
F & C Services Inc	PO Box 24522	Ft Worth	TX 76112	A
F & E Business Forms	10657 Shady Trail	Dallas	TX 75220	A
F K Taylor Co	1246 Tatum	Dallas	TX 75211	F
F & R Construction	3880 S. Beckley, # 4608	Dallas	TX 75224	F
Fabricating Machinery, Inc.	6315 Toronto Street	Dallas	TX 75212	A
FabTech Machining	1418 Upfield Drive	Carrollton	TX 75006	A
Facility Construction Serv	4300 Pennsylvania Ave	Dallas	TX 75210	A
Factory Parts Depot Inc	500 So Good Latimer	Dallas	TX 75226	A
Falcon Detective Agency &	10204 Garland Rd	Dallas	TX 75218	A
Family Eye Clinic /	525 E. Hwy. 287 / P.O. Box 476	Midlothian	TX 76065	A
Family Medicine	1300 North Anglin, P.O. Box 97	Cleburne	TX 76033	A
Far West Products, Inc. (	302 Spencer Ln.	San Antonio	TX 78201	B
Farrington Engineering	4410 W Vickery	Ft Worth	TX 76107	A
Fast & Reliable Limousine	3229 Chapel Creek Dr., #236	Dallas	TX 75220	F
Faye's Specilaty	P.O. Box 123	Cleburne	TX 76031	G
Featherline Building	3815 Singleton Blvd	Dallas	TX 75212	B
Federal Communications	1950 Stemmons Frwy Ste 5001	Dallas	TX 75207	I
Feemster Portable	205 287 South	Midlothian	TX 76065	A
Fermont	9858 Plano Rd Suite 100	Dallas	TX 75238	A
Ferro Tech Industries Div	4615 Post Oak Place #295	Houston	TX 77027	A
Ferro Union Inc	1800 W Marshall Dr	Grand Prairie	TX 75051	M
File Solutions, Inc.	P.O. Box 516381	Dallas	TX 75251-6381	G
Filmstrips & Slides Inc	PO Box 190721	Dallas	TX 75219-0721	A
Finger Furniture Rental	P.O. Box 123049	Fort Worth	TX 76121-3049	B
Fire & Safety Protection	611 Williams	Waxahachie	TX 75165	A
Fire Systems International,	10606 Shady Trail Suite B3	Dallas	TX 75220	A
First Resource	PO Box 110738	Dallas	TX 75011-0738	F
First Savings Bank, FSB	100 East South Street	Arlington	TX 76010	A
First Word	14785 Preston Rd #890	Dallas	TX 75240	B
Fisher Scientific	900 Stewart Ave Box 869022	Plano	TX 75086-9022	B
Fisk Electric Co	PO Box 542645	Dallas	TX 75354-2645	B
Fitch Electric Supply Inc	5107 Lawnview	Dallas	TX 75227	A
Fitzgerald Electric Inc	PO Box 1453	Midlothian	TX 76065	G
Flair Data Systems	3530 Forest Lane Ste 195	Dallas	TX 75234	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Flangco Inc	1810 Oak	Texarkana	TX 75501	A
Fleetwood Travel Trailers	PO Box 7909	Longview	TX 75607	B
FLEX-ING, Inc.	2812 Fallon Drive	Sherman	TX 75090	A
Flo Enterprise - Div. Flo	7557 Rambler Rd./ Suite 750	Dallas	TX 75231	F
Flopure, Inc.	431 Isom Road #119	San Antonio	TX 78216	A
Flow Systems, Div. of	P.O. Box 832174	Richardson	TX 75083	A
Flowers By Dennis	4041 W Wheatland Rd Ste 108/ Box	Dallas	TX 75237	I
Flowers Construction Co	PO Box 1207	Hillsboro	TX 76645	A
Fls Industries Inc	3619 Dalworth	Arlington	TX 76011	A
Fluid Dynamics	P.O. Box 800099	Dallas	TX 75380-0099	A
Flygt Corporation	PO Box 597	Addison	TX 75001	B
FMC Information	1460 Roundtable	Dallas	TX 75247	A
Focus Point Inc	3939 Beltine Rd #421	Dallas	TX 75244	A
Force Electronics	3218 Beltine Rd Ste 510	Farmers Branch	TX 75234	A
Foreman Office Products	1507 Main St	Dallas	TX 75201	I
Forms Professional Inc	PO Box 9509	Amarillo	TX 79109	G
Fort Knox Protection Inc	111 Executive Way #102	DeSoto	TX 75115	G
Fort Worth Aluminum	P.O. Box 4587	Fort Worth	TX 76106	A
Fort Worth Design & Build	2400 Great Southwest Parkway	Ft. Worth	TX 76106	A
Fort Worth Scientific	3120 St. Louis Ave	Fort Worth	TX 76110	I
Four Horsemen Protective	PO Box 136189	Ft Worth	TX 76136	I
Four R Industrial Supply	Po Box 810	Borger	TX 79008-0810	A
Fox Scientific	4571 S Westmoreland	Dallas	TX 75237	F
Foxworth-Gabraith Lumber	201 S Loop 340	Waco	TX 76710	A
Foxworth-Galbraith	1006 W 3rd St	Carrollton	TX 75006	A
Foxworth-Galbraith	3701 S General Bruce Dr	Temple	TX 76501	A
Foxworth-Galbraith	100 N Bosque (Hwy 22)/PO Box 217	Whitney	TX 76692	A
Fran Vincent	Rt 1 Box 123	Rice	TX 75155	G
Frank A Murrell	6510 Prairie Dr	Houston	TX 77069	A
Frank L Meier Architects	3400 Carlisle Suite 300	Dallas	TX 75204	A
Fred B. Parker - Architect	P.O. Box 1016	Stephenville	TX 76401	A
Fredericksburg Industries	411 S Lincoln St	Fredericksburg	TX 78624	A
Freewood Products	P.O. Box 29785	Dallas	TX 75229	G
Fruehauf Trailer	P.O. Box 560865	Dallas	TX 75356	B
Ft Worth Design & Build	2400 Great Southwest Parkway	Ft Worth	TX 76106	A
Ft Worth Lumber Co	PO Box 969	Ft Worth	TX 76101-0969	A
Ft Worth Rubber Stamp Co	2324 Tamarisk	Plano	TX 75023	G
Ft Worth Welders Supply	3210 Fisher	Ft Worth	TX 76111	A
Fulton Business Machines	1920 McKinney Ave	Dallas	TX 75201	A
Fulton & Mizell Surveying	115 St Louis Ave	Ft Worth	TX 76104	A
Functional Capacity	1519-21 Jacksboro Hwy	Ft Worth	TX 76114	G
Furlong Engineering, Inc.	720 Brazos Suite 702	Austin	TX 78701	A

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FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Furon/Structural Bearings	P.O. Box 1580	Athens	TX 75751	B
FWF Inc	701 S Beckley	DeSoto	TX 75115	A
G E Mobile	13747 Montfort Ste 101	Dallas	TX 75240	B
G F Office Furniture, Inc.	3131 McKinney Ave Lock Box 112	Dallas	TX 75204	B
G.I.D.	4124 Main	Dallas	TX 75226	F
G.J. Kincade, CPA	15330 LBJ Freeway Suite 1052	Mesquite	TX 75150	A
G Rogers International	2431 Cambridge	Irving	TX 75061	A
G2 Inc, The Intelligence	1950 Stemmons Freeway , Suite	Dallas	TX 75207	A
Gafiey Inc Of Texas	Rt 2 Box 2062	Cleveland	TX 77327	A
Gaging Systems/Division	P.O. Box 29187	Dallas	TX 75229	A
Gagnaire and Goode	PO Box 820515	Dallas	TX 75382-0515	G
Galindo Engineers &	1900 W Villa Maria	Bryan	TX 77801	F
Galindo Engineers &	1900 West Villa Maria	Bryan	TX 77801	F
Galis Enterprises, Inc.	P.O. Box 13334	Arlington	TX 76094-0334	A
Gandy Discount Office	P.O. Box 8509	Tyler	TX 75711	A
Gar-Tex Construction Co.	402 Birchwood Dr , PO Box 475488	Garland	TX 75043	A
Garcia Diversified	PO Box 122265	Ft Worth	TX 76121	F
Gardner Travel Service Inc	8445 Freeport Pkwy Ste 445	Irving	TX 75063	A
Garfield Machine Products	1500 B So Beckley Rd	Lancaster	TX 75115	A
Garco Inc	2433 Lacy Lane S-107	Carrollton	TX 75006	A
Garland Paper Company	4951 Grisham/P O. Box 209	Rowlett	TX 75088-0209	F
Garland Shields	117 Wandering Court	Weatherford	TX 76086	A
Gary Boren--Boren &	6413 University Ave	Lubbock	TX 7943	F
Gary L. Blevins &	9400 North Central Expressway Suite	Dallas	TX 75231	A
Gasket & Packings Inc	PO Box 161	Borger	TX 79008-0161	A
Gate Concrete Products	PO Box 38	Pearland	TX 77588-0038	B
Gateway Travel & Tours	4201 Spring Valley Rd #104	Dallas	TX 75244	F
Gaye's Construction Co	PO Box 561	Ennis	TX 75120	G
Gaynor & Sirmen, Inc.	6060 North Central Expressway Suite	Dallas	TX 75206	A
GB Tech Inc	18333 Egret Bay Blvd Ste 580	Houston	TX 77058	F
GE Computer Service	5150 Springwood Dr Suite 200	Irving	TX 75063	B
Gearench, Inc.	Hwy 6 South P.O. Box 192	Clifton	TX 76634	A
Gearench, Inc.	Hwy 6 South/P.O. Box 192	Clifton	TX 76634	A
General Binding	2701 W. Airport Freeway Suite 117	Irving	TX 75062	A
General Building	3853 E. 1st Street	Fort Worth	TX 76111	A
General Design	3301 N. Hwy. 67, Suite A	Mesquite	TX 75150	B
General Devices Inc	PO Box 35513	Dallas	TX 75235	B
General Electric Company	14131 Midway Rd. Suite #500	Dallas	TX 75244	B
General Electric Supply	11221 Pagemill Rd	Dallas	TX 75243	B
General Machined	3525 E Vickery Blvd	Ft Worth	TX 76105	G
General Micrographics	310 South 13th Street	Waco	TX 76701-1819	A
General Packaging	P.O. Box 835270	Richardson	TX 75083	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
General Paving Inc		Coppell	TX 75019	A
Genesis Consulting Group	9550 Skillman St LB 109	Dallas	TX 75243	G
Geneva Tate	100 North Walnut Creek Dr	Mansfield	TX 76063	G
Genicom Corporation	5050 Quorum Dr Suite 400	Dallas	TX 75240	B
Genie Travel Services	215 E Beltline Rd Suite A	DeSoto	TX 75115	G
Geo-Marine Inc	1316 Fourteenth St	Plano	TX 75074	F
Geo-Tekton Services Inc	PO Box 59669	Dallas	TX 75229	A
GeoControl Systems, Inc.	1720 Nasa Rd One, Suite 100	Houston	TX 77058	A
Geogram Corporation	2710 N Stemmons Frwy Ste 301	Dallas	TX 75207	B
George Donaldson Real	2205 Austin Ave	Waco	TX 76703	A
George W. Muery	P.O. Box 100126	San Antonio	TX 78201-1426	G
George/McKenna	2319 E Grauwyler	Irving	TX 75061	A
Georgetown Railroad	P.O. Box 529	Georgetown	TX 78627	B
Georgia A. Wilson &	3900 Exxex Lane, Suite 700	Houston	TX 77277	G
Georgram Corp	2710 N Stemmons Frwy Ste 301	Dallas	TX 75207	B
Geotest Engineering, Inc.	5600 Bintliff Drive	Houston	TX 77036	F
Geotest Engineering, Inc.	5600 Bintliff Drive	Houston	TX 77036	F
Gertie Mae Perkins	3001 Walker Street	Fort Worth	TX 76105	I
Gibbs Trucking	PO Box 1059	Graham	TX 76046	F
Gibson & Associates, Inc.	P.O. Box 800579	Balch Springs	TX 75180-0579	G
Gibson & Associates, Inc.	P.O. Box 800579	Balch Springs	TX 75180-0579	G
Gifford-Hill Chemical	PO Box 190999	Dallas	TX 75219-0999	B
Gilbert Specialty Company	5821 East Rosedale	Fort Worth	TX 76112	F
Gilbert's Battery Service	1902 West Jefferson	Dallas	TX 75208	F
Gilbert/Cox Inc	2828 Centerville Rd #106	Dallas	TX 75228	A
Gilmore Valve Company	PO Drawer 39	Bellaire	TX 77401	A
Ginn Inc Consulting	17103 Preston Rd Suite 100 LB 118	Dallas	TX 75248	A
Glasgal Communications	555 Republic M #200	Plano	TX 75074	A
Glass Steel/Division of	P.O. Box 2765	Spring	TX 77383	B
Glass-Steel Div Of MMFG	PO Box 2765	Spring	TX 77383	B
Glassal Communications	555 Republic M Ste 200	Plano	TX 75074	A
Glenn Smith Installations	1611 W Ennis Ave	Ennis	TX 75119	A
Glitsch Special Products	4900 Singleton Blvd Ste 2	Dallas	TX 75212	B
Global Electro-Comm Inc	500 N Central Expwy Ste 261	Plano	TX 75074	F
Global Electro-Comm., Inc.	500 North Central Expressway Suite	Plano	TX 75074	F
Global Fasteners Inc	10634 Control Place	Dallas	TX 75238	A
Global Moving and	3151 E Carpenter Frwy	Irving	TX 75062	A
Global Technical Services	4901 N. Beach Street	Fort Worth	TX 76137	A
Global Trading	1313 Cedar Post Lane	Houston	TX 77055	F
Globe Products Co Inc	PO Box 754/1490 Jack McKay Blvd	Ennis	TX 75120	A
Gloria Carter/Americare	P.O. Box 460772	Garland	TX 75046	I
Glover Rubber Stamp	3611 Bryan St	Dallas	TX 75204	G

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
GM Construction Inc	630 N Hwy 67 Ste 1	Cedar Hill	TX 75104	F
GM Int Inc	511 So Fifth Ave	Mansfield	TX 76063	A
GMA Architects	6730 LBJ Freeway Suite 2235	Dallas	TX 75240	A
Gnames Enterprises	222 W. Las Colinas Blvd., Ste. 1450	Irving	TX 75039	G
GNWC/Tele-Cable	1323 Columbia Dr Suite 301	Richardson	TX 75081	A
Go-Crete	PO Box 4400	Dallas	TX 75208	A
Goal Line Promotions	3525 Jim Wright Frwy	Ft Worth	TX 76106-3201	A
Gohmann Asphalt &	3609 Pinehurst Court	Plano	TX 75075	B
Golden Eagle Systems Inc	10460 Shady Trail #100	Dallas	TX 75220	A
Golden Eagle Systems,	10460 Shady Trail #100	Dallas	TX 75220	A
Golden Triangle and	P.O. Box 239	Lufkin	TX 75902	A
Goodall Rubber Company	PO Box 541086	Dallas	TX 75354	B
Goodwin and Marshall,	6001 Bridge Street Suite 100	Fort Worth	TX 76112	A
Goolsby Building Corp	PO Box 642	Temple	TX 76503	A
Gore's American Business	3611 Live Oak St	Dallas	TX 75204	A
Gossen & Associates	3737 Broadway Suite 340	San Antonio	TX 78209	A
Gothard Industries	1507-1509 East Wheatland Road	Lancaster	TX 75134	A
Gradco Systems	1313 Valwood Parkway Ste 150	Carrollton	TX 75006	A
Graebel/Dallas Movers,	P.O. Box 31046	Dallas	TX 75231-0046	B
Graff's Custom Carpentry	Route 4-2606 Laneview Drive	Ennis	TX 75119	A
Grantham Heating & Air	PO Box 29173	Dallas	TX 75229	A
Graphics 2	701 Pennsylvania Ave.	Ft. Worth	TX 76104	A
Graves Co	8829 Hackney	Dallas	TX 75238	A
Graybar Electric	Po Box 655094	Dallas	TX 75265	B
Great Plains Graphics, Inc	P.O. Box 1677	Weatherford	TX 76086	A
Great Southwestern Fire &	1301 East Jefferson Suite C	Grand Prairie	TX 75051	F
Great Southwestern	P.O. Box 93	Cleburne	TX 76033	A
Great Western Supply	2227 Wisconsin	Dallas	TX 75229	A
Green Specialty Service,	2615 St.Louis Street	Fort Worth	TX 76110	A
Greenscape Pump	P.O. Box 934	Coppell	TX 75019	A
Greer's Air Conditioning &	2911 Fordham Rd	Dallas	TX 75216	F
Greg Blevat Sales	1019 Roberts	Houston	TX 77003	A
Greg Franz Consulting	6243 IH 10 West Suite 935	San Antonio	TX 78201	A
Greg Uetrecht/DPRA	Cumberland Hill School Bldg/1901 N.	Dallas	TX 75201	B
Gregory Construction	408 East Road	Stephenville	TX 76401	A
Greiner Engineering Inc	909 E Las Colinas Blvd Ste 1900	Irving	TX 75039-3907	B
Greyhound Exhibitgroup	8401 Ambassador Row	Dallas	TX 75247	B
Gribble Stamp & Stencil	PO Box 4068	Houston	TX 77210-4068	A
Grinnell Fire Protection	2425 E Pioneer Dr	Irving	TX 75061	B
GRK inc	690 N Glenville	Richardson	TX 75083	G
Gross-Yowell & Company	P.O. Box 7615	Waco	TX 76714-7615	A
Ground Technology, Inc.	5904 Jessamine Suite A-5	Houston	TX 77081	F

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FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Groundwater Services	P.O. Box 1201	Athens	TX 75751	A
GT Industries Of Texas	2600 North Haven Rd	Dallas	TX 75229	A
GTE Mobile	1906 North Story Rd	Irving	TX 75061	B
GTT Electronics	651 N. Plano Rd Suite 419	Richardson	TX 75081	F
GTT Electronics	651 North Plano Rd Suite 419	Richardson	TX 75081	F
Guardco	11500 Stemmons Ste 178	Dallas	TX 75229	B
Guardian Protective	308 W. Cannon	Fort Worth	TX 76104-3303	G
Guardian Purchasing	3276 Quebec Street	Dallas	TX 75247	A
Guardian Storefront	10925 Shady Trail	Dallas	TX 75220	A
Gulf Forge Co	PO Box 2926	Houston	TX 77252	A
Gulf Systems, Inc.	357 Exchange	Arlington	TX 76011	A
Gulfco Press	3018 Lincoln Court	Garland	TX 75041	C
Gulfco Printing	3018 Lincoln Ct.	Garland	TX 75041	F
Gundle Lining Const Corp	19103 Gundle Rd	Houston	TX 77073	B
Gunnin-Campbell	4311 Oak Lawn Ave Suite 500 Lock	Dallas	TX 75219-2315	B
H. B. Blake Company, Inc.	P. 0. Box 400	Hewitt	TX 76643	A
H B. Neild & Sons, Inc.	P.O. Box 22555	Beaumont	TX 77720	A
H B Zachry Construction	PO Box 21130	San Antonio	TX 78221	B
H & D Oil Company, Inc.	P.O. Box 8949	Waco	TX 76714	A
H.E. Wright & Co. , Inc.	P. 0. Box 5428	Texarkana	TX 75505	A
H F Construction Co Inc	PO Box 12227/9200 Douglas Ave	Dallas	TX 75224-0227	F
H & H Oil Co inc	PO Box 128	Waxhachie	TX 75165	A
H J Hicks & Company	777 SRL Thornton Ste 107	Dallas	TX 75203	F
H & K Dallas	1343 S Henderson Ave	Dallas	TX 75223	A
H.L. Yoh Company	1601 East Lamar Blvd Suite 214	Arlington	TX 76011	B
H & M Associates Of Texas	1304 Walnut Hill Lane #222	Irving	TX 75038	A
H. Williams & Sons Sand	P.O. Box 603	Cleburne	TX 76031	A
Habbing Construction	207 BSW Main	Ennis	TX 75119	F
Hager Containers Inc	12855 Valley Branch Lane	Dallas	TX 75234	A
Hagler Construction	1701 N Collins Suite 303	Richardson	TX 75080	A
Halal, Incorporated dba	3216 West Park Row, Suite G	Arlington	TX 76013	A
Halbert Metals, Inc.	105 Sentry Drive North	Mansfield	TX 76063	A
Haldeman Powell Johns	15303 Dallas Parkway Suite 300	Dallas	TX 75248	A
Hall & Son Woodworks	601 W Main	Henderson	TX 75652	A
Hall-Mark Electronics	11420 Pagemill Rd	Dallas	TX 75243	B
Hallnark Builders of	7035 W. Tidwell Suite 111	Houston	TX 77092	A
Haloy Industrial Supply Co	9206 Winkler Rd/PO Box 87889	Houston	TX 77287-7889	F
Halsey Engineering &	209 Mayhill Rd	Denton	TX 76201	A
Haltom Construction	Route 4 Box 330-A	Marshall	TX 75670	G
Hamilton/Avnet Co	4004 Beltine Rd Ste 200	Dallas	TX 75244	B
Hamilton/Avnet Electronics	4004 Belt Line Rd Suite 200	Dallas	TX 75244	B
Hammonds Automotive	411 West Texas	Mesquite	TX 75149	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Handy Andy Janitoral	PO Box 867133	Plano	TX 75086	F
Hanks Machinery Moving	650 Skyline Drive	Hutchins	TX 75141	A
Hanks Machinery Moving	650 Skyline Drive	Hut chins	TX 75141	A
Hannon Hydraulics Inc	625 N Loop 12	Irving	TX 75061	A
Hansen's General	1419 Godwin	Duncanville	TX 75116	A
Hard Hat Microsystems	1118 Bolivar	Denton	TX 76201	G
Hardge Landscape &	Route 8 Box 2346	Cleburne	TX 76031	A
Hargrove Electric Co	PO Box 566077	Dallas	TX 75356	A
Harlow Filter Supply	1724 S Alark	Dallas	TX 75215	G
Harold A O'Neil	PO Box 466	Roanoke	TX 76262	A
Harper Kemp Clutts and	4131 N Central Expwy Suite 400	Dallas	TX 75204	A
Harrington Ellis &	777 E. 15th Street	Plano	TX 75074	G
Harris-Hughes Inc	PO Box 5482	Kingwood	TX 77325	A
Harry B. Carroll Surveyors	321 Broadway Blvd Suite 202	Garland -	TX 75043	A
Hart Forms & Systems	2636 Walnut Hill Lane, Suite 347	Dallas	TX 75229	B
Hartford Steam Boiler	15415 Katy Freeway #300	Houston	TX 77094	B
Hastings, Trevino &	4455 LBJ Freeway Suite 607	Dallas	TX 75244	F
Haukos Construction	6103 Bluff Point Drive	Dallas	TX 75248	G
Hawk Construction	4205 Sherwood	Amarillo	TX 79110-4130	G
Hawkeye Hunting	P.O. Box 27	Center	TX 75935-0027	B
Hawkins Services, Inc.	3630 Colosseum Way	Grand Prairie	TX 75051	G
Hawrylak & Associates.	P.O. Box 13574	Arlington	TX 76094	A
Hayes informastion	1700 Alma Dr Suite 235	Plano	TX 75075	G
Hayes Information	1700 Alma Dr Suite 235	Plano	TX 75075	G
Haymon Mitchell Masonry,	5047 Wilburger Street	Fort Worth	TX 76119	F
Haywood Jordan	409 Centre Street	Dallas	TX 75208	F
HCB Contractors	1401 Elm St Suite 4600	Dallas	TX 75202	B
HDL Research Lab, Inc.	406 West Horton Street	Brenham	TX 77833	A
Head Paint &	6110 P Milwee	Houston	TX 77092	A
Hector Gomez Engineers	11520 N Central Expy Ste 231	Dallas	TX 75243-6608	F
Hector Gomez Engineers	11520 North Central Expressway	Dallas	TX 75243-6608	F
Heep & Leonard, Inc.	14837 Trinity Blvd	Fort Worth	TX 76155	A
Heery Program	7557 Rambler Rd Ste 464	Dallas	TX 75231	A
Helen Lee Hearon	407 N Cedar Ridge Ste 130	Duncanville	TX 75116	A
Herbert L. Flake Company	2511 Broad Street	Houston	TX 77087	A
Hercules Engineering &	PO Box 801973	Houston	TX 77280-1973	A
Hereford Travel Center	144 West Second St	Hereford	TX 79045	G
Heritage Constructors Inc	PO Box 5903	Texarkana	TX 75505	A
Herman Miller Inc c/o	3232 McKinney S-1100	Dallas	TX 75204-2429	B
Herry Program	7557 Rambler Rd Ste 464	Dallas	TX 75231	A
Hertz Equipment Rental	2936 Irving Blvd	Dallas	TX 75247	B
Hestron Computer Cables	9320 South R.L Thornton Freeway	Dallas	TX 75232	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Hewlett Packard Company	3301 Royal Lane	Iving	TX 75063	B
Hi-Tec Associates Inc	2000 E Lamar Blvd #560	Arlington	TX 76006	F
HI-TEC Associates, Inc.	2000 E. Lamar Blvd #560	Arlington	TX 76006	F
Hi-Tec Associates, Inc.	2000 East Lamar Blvd #560	Arlington	TX 76006	F
Hi-Tech Electric Inc	2787 Irving Blvd Ste 200	Dallas	TX 75207	B
Hi-Tech Supply Inc	1738 N Greenville Ave	Richardson	TX 75081	A
High Tech Services, Inc.	315 N. Interurban, # 103	Richardson	TX 75081	A
Highland Village General	3103 Miracle Lane	Flower Mound	TX 75028	G
Highrise Building	2750 Northhaven Rd., Suite 209	Dallas	TX 75229	F
Hill & Wilkinson Inc	11969 Plano Rd #190	Dallas	TX 75243	B
Hilti Inc	13635 Stemmons Ste 200	Farmers Branch	TX 75234	B
Hinderliter Heat Treating	2005 Montgomery St	Ft Worth	TX 76107	A
His Janitorial Service &	P.O. Box 136221	Fort Worth	TX 76136	A
Hisco	10863 Rockwall Road	Dallas	TX 75238	A
Hispanic BiLine, Inc.	660 South Zang/P.O. Box 4280	Dallas	TX 75208	F
Hixson, Harris & Winters,	6730 LBJ Freeway Suite 2225	Dallas	TX 75240	A
Holden Business Forms	1800 Timberlake Drive	Arlington	TX 76010	B
Holland Janitorial Supply	205 W Crockett	Ennis	TX 75119	A
Holleman Construction Co	123 Julian St	Dallas	TX 75203-1089	A
Holley's Dump Truck	258 Ward Rd	Midlothian	TX 76065	A
Holmes Transfer Inc	Rt 6 Box 116	Ennis	TX 75119	F
Honeywell Commercial	14350 Proton Rd	Dallas	TX 75244	B
Hooper Engineering	2870 Walnut Hill Lane	Dallas	TX 75229	B
Hoover Enterprises Inc	1013 Overhill Dr	Bedford	TX 76022	B
Hoover Systems Inc	12118 Corporate Dr	Dallas	TX 75228	A
Horizon Computer	2410 Villanova St	Arlington	TX 76018	I
Horizon Office Products &	500 N Hwy 77 Ste 612	Waxahachie	TX 75165	G
Horne's Custom Sign	P.O. Box 1382	Alvarado	TX 76009	A
Hosea Linwood	1211 Georgia St	Dallas	TX 75216	F
Hotfoil	2331 Gus Thomasson #128	Dallas	TX 75228	A
Hotsy Equipment Co	3028 Lincoln Ct	Garland	TX 75041	F
Houston 2-Way Radio	11514 Clover Lane Court	Houston	TX 77066	A
Houston Applied Logic	PO Box 890094	Houston	TX 77289-0094	G
Houston Chapter,	P.O. Box 662	Houston	TX 77001	B
Houston Datum Corp dba	P.O. Box 297	South Houston	TX 77587	A
Houston Engineering	7250 Wynnwood Drive	Houston	TX 77008	A
Houston Foam Plastics,	P.O. Box 1615	Houston	TX 77251-1615	A
Houston Helicopters Inc	PO Box 830	Pearland	TX 77581	A
Houston Wire & Cable	13801 Senlac Dr Ste 200	Dallas	TX 75234	B
Houston Wire Works	514 Michigan	Houston	TX 77587	A
Howard Cement	3540 South Freeway	Fort Worth	TX 76110	F
Howard Needles Tammen	14114 Dallas Parkway Suite 630	Dallas	TX 75240	B

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	
Howe Building Corp.	P.O. BOX 1908	Temple	TX 76503	I
HTS Inc Consultants	416 Pickering	Houston	TX 77091-3312	I
Hudson's	607 Creek Acres Dr	Palmer	TX 75172	[illegible]
Hudson's Industrial	607 Green Acres Dr	Palmer	TX 75152	A
Hudson-Rush Company	11450 Pagemili Rd	Dallas	TX 75243	A
Hufthines [illegible] Company	P.O. Box 3960	Dallas	TX 75208	A
Hughes Engineering &	500 N Valley Mills Dr Ste 213	Waco	TX 76710	G
Hugo Monsanto &	343 Ashford Ln	Midlothian	TX 76065	A
Huitt-Zollars Inc	3131 McKinney Ave Suite 600	Dallas	TX 75204	B
Huitt-Zollars, Inc.	3131 McKinney Ave, Suite 600	Dallas	TX 75204-2416	B
Humphrey & Assoc Inc	PO Box 59247	Dallas	TX 75229	B
Hundley Enterprises Inc	3220 N Main	Cleburne	TX 76031	A
Hurst Texas	4633 Royal Court Circle	Abilene	TX 79606	A
HVGC Inc	517 Greenbriar inc	Lewisville	TX 75067	G
HVJ Associates, Inc.	5925 Sovereign Suite 115	Houston	TX 77036	F
Hyatt Regency Dallas	300 Reunion Blvd	Dallas	TX 75207	B
Hydraquip Corporation	1119 111th Street	Arlington	TX 76011	A
Hydro-Pneumatic	P.O. Box 5226	Arlington	TX 76006	G
Hydrotreat Inc	P Box 34040	Houston	TX 77234	A
Hygenic Cleaning Service	2102 Wilcrest #323	Arlington	TX 76010	G
Hyph Information	506 Villa Creek	Duncanville	TX 75137	I
ICS Telephones Inc	480 E Ben White Blvd	Austin	TX 78741	A
Ideal Rentals Inc	119 Dallas Hwy	Waxahachie	TX 75165	F
IEA	2331 Gus Thomasson #128	Dallas	TX 75228	I
ILC Space Systems	16665 Space Center Blvd	Houston	TX 77058	B
licor	PO Box 6070	Austin	TX 78767	A
Image Photography	206 North Main	Mansfield	TX 76063	G
Impact Distributing	P.O. Box 4386	Tyler	TX 75712	I
Imperial Travel Agency Inc	4851 LBJ Frwy Suite 105	Dallas	TX 75244	I
IMS Computer Services	1950 Stemmons Frwy Ste 5001	Dallas	TX 75207	F
Indel-Davis, Inc.	2512 Program Dr Suite 111	Dallas	TX 75220	A
Independent Catering	2633 Ferris St	Dallas	TX 75226	A
Index Computer, Inc.	3160 Common Wealth #190	Dallas	TX 75247	F
Indian Industries	419 Dodson Lake Dr	Arlington	TX 76012	F
Individual Services	8314 W. Melrose	Fort Worth	TX 76108	A
Individual Services	8314 West Melrose	Fort Worth	TX 76108	A
Industrial Air Tool Pa Inc	PO Box 1619	Pasadena	TX 77501	A
Industrial Construction	1301 E Parkerville Rd	DeSoto	TX 75115	A
Industrial Energy	2331 Gus Thomasson #128	Dallas	TX 75228	A
Industrial Equipment	P.O. Box 38499	Dallas	TX 75238	A
Industrial Excavating	1710 East Tucker Blvd	Arlington	TX 76010	F
Industrial Gas	4116 Roseway	Houston	TX 77025	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Industrial Maintenance	355 Yorktown	Dallas	TX 75208	G
Industrial Rigging Service,	P.O. Box 1449	Round Rock	TX 78680	A
Industrial Safety, Ltd	3300 S. Jones	Fort Worth	TX 76110	G
Industrial Seal of Texas,	10420 Plano Rd Suite 112	Dallas	TX 75238	A
Industrial Steam Cleaning	P.O. Box 113	Iraan	TX 79744	A
Industrial Supply Co	PO Box 1745	Laredo	TX 78044	F
Industrial Video Services	PO Box 1487	Bellaire	TX 77402	A
Industrial Welding Supply	5932 S Freeway	Ft Worth	TX 76115	A
Information and Research	PO Box 850726	Richardson	TX 75085-0726	A
Information & Research	PO Box 850726	Richardson	TX 75085-0726	A
Information Services	4201 Spring Valley Rd Suite 1400	Dallas	TX 75244	F
Information Support	1221 W. Campbell, Suite 201	Richardson	TX 75080	A
Ingram Excavation, Inc.	Route 6 Box 1076	Cleburne	TX 76031	I
Innovative Design Group	1825 Market Center Blvd. Suite 480	Dallas	TX 75207	F
Innovative Office Systems	14875 Landmark Blvd Ste 400	Dallas	TX 75240	A
Insulated Panel Systems	PO Box 968/13202 Murphy Rd	Stafford	TX 77497-0968	A
Insulation Systems Inc	2367 Glenda Ln	Dallas	TX 75229	A
Insulation Technicians Co	PO Box 7414	Midland	TX 79708	F
Intec Engineering Inc	16801 Greenspoint Park Dr Suite	Houston	TX 77060	A
Integrated Computer	2400 Lakeside Blvd Suite 440	Richardson	TX 75082	A
Integrated Production	727 109th Street/P.O. Box 5704	Arlington	TX 76011	A
Intelog Incorporated	2723 Avenue E, Suite 701	Arlington	TX 76011	A
Intercoastal Sales Co Inc	PO Box 1547	LaPorte	TX 77571	A
Intercontinental	1200 North Glenbrook Drive	Garland	TX 75046	B
Interfet Corporation	322 Gold St	Garland	TX 75042-6643	A
Interior Systems &	15534 West Hardy Ste 100	Houston	TX 77060	A
Interlink Transportation	P.O. Box 29279	Dallas	TX 75229	A
Interlink Ventures, Inc.	P.O. Box 90140 - 127	Arlington	Tx 76016	A
Interna. Modular & Panel	P.O. Box 12906	Houston	TX 77217	A
International Business	777 Post Oak Blvd., Suite 509	Houston	TX 77056	F
International Business	1605 LBJ Freeway	Dallas	TX 75234	B
International Chem-Crete	800 Security Row	Richardson	TX 75081	F
International Exterminator	1200 Summit, Ste. 430	Ft. Worth	TX 76102	A
International Exterminator	1200 Summit, Ste. 430	Ft. Worth	TX 76102	A
International Extrusion	202 Singleton Dr	Waxahachie	TX 75165	B
International Grating Inc	PO Box 298921	Houston	TX 77298	A
International Supply of	P.0. Box 1432	Longview	TX 75606	A
Interphase Corporation	13800 Senlac Drive	Dallas	TX 75234	B
Interprise/Southwest	13455 Noel Road, Suite 2300	Dallas	TX 75240	D
Interstate Fire Protection	P.O. Box 116890	Carrollton	TX 75010	A
Interstate Wire Company	P.O. Box 38413	Dallas	TX 75238	A
Intertech Engineers Inc	13150 Coit Rd Ste 125	Dallas	TX 75240	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
MobileComm/BellSouth	6221 North O'Connor Ste 116	Irving	TX 75039	B
Modern Inc	Po Box 790	Beaumont	TX 77704	A
Modern Interiors	415 E Airport Frwy	Irving	TX 75062	F
Modern Pest Control Inc	10816 Fallstone #510	Houston	TX 77099	G
Modern Tire Service, Inc.	634 West Mockingbird Lane	Dallas	TX 75247	B
Modular Furniture	4265 Kellway Circle	Addison	TX 75244	F
Mohammad A Samad	9441 Daleglade Dr	Dallas	TX 75217	F
Molina & Associates Inc	703 McKinney Ste 432	Dallas	TX 75202	A
Molina & Associates, Inc.	703 McKinney Suite 432	Dallas	TX 75202	F
Monk Engineering, Inc.	15702 West Hardy #240	Houston	TX 77060	A
Monroe Machine	3359 Garden Brook	Dallas	TX 75234	G
Montclair Enterprises Inc	PO Box 6008	Arlington	TX 76005-6008	A
Montgomery Elevator	2433 Arbuckle Court	Dallas	TX 75229	B
Mony Financial Services	100 North Central Expressway Suite	Richardson	TX 75080	B
Moody - Day, Inc.	P.O. Box 565548	Dallas	TX 75356	F
Moore Business Forms &	14850 Quorum Dr Ste 500	Dallas	TX 75240	B
Moore Supply Co	PO Box 448	Conroe	TX 77305-0448	A
Moore's Ace Hardware	500 Hwy 77 #200	Waxahachie	TX 75165	G
Morales Advertising &	12770 Coit Rd Suite 905	Dallas	TX 75251	F
Morgan Building Systems	2800 McCree Rd	Garland	TX 75041	B
Morgan Building Systems	PO Box 660280	Dallas	TX 75266-0280	B
Morley-Moss, Inc.	4350 Cedar Lake	Dallas	TX 75227	A
Morrell Plating Company,	2712 Anson Rd	Dallas	TX 75235	A
Morris Coupling Company	422 Spanish Moss	Coppell	TX 75019	A
Morris Power Sweeping	208 Ridgecrest Drive	Hurst	TX 76053	A
Morrison Sign &	3108 Garden Brook Dr	Dallas	TX 75234	A
Mosby Mechanical Co Inc	PO Box 8582	Longview	TX 75607	A
Mott's Wallcovering	2507 Richmond Drive	Arlington	TX 76014	G
Mouser Electronics	2401 Hwy 287 N	Mansfield	TX 76063	F
MP Systems	13745 Neutron Rd	Dallas	TX 75244	A
MQS Inspection, Inc.	3741 Trailmobile Dr/P.O. Box 24690	Houston	TX 77229	B
MQS Inspection, Inc.	P.O. Box 24690	Houston	TX 77229	B
Mr D's Inc	PO Box 831	Cleburne	TX 76033	A
Mr. Micro	17174 Preston Rd	Dallas	TX 75248	B
MSC Industrial Supply	9249 King James Rd	Dallas	TX 75247	B
MSQ	5495 Beltline Road Suite 380	Dallas	TX 75240	F
MSQ Engineering Inc	5495 Belt Line Rd Suite 380	Dallas	TX 75240	F
MTX Services	PO Box 788	Midlothian	TX 76065	A
Mueller & Wilson Inc	PO Box 17659	San Antonio	TX 78217	A
Muhammad A Samad	9441 Daleglade Dr	Dallas	TX 75217	B
Mullins Industries	P O Box 871323	Dallas	TX 75287-1323	A
Multatech Engineering,	110 E. 3rd Street, Suite 350	Fort Worth	TX 76102	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Multi - Amp Corp.	4271 Bronze Way	Dallas	TX 75237	B
Murdock Engineering	5100 Airport Freeway West	Irving	TX 75062	B
Murdock Enterprises Inc	PO Box 771	Cleburne	TX 76033	A
Murphy & Sons Inc	2662 Center St	Deer Park	TX 77536	A
Murr Bros. Electric	7120 Military Parkway	Dallas	TX 75227	A
Murray A. Goldenberg	4050 Black Gold	Dallas	TX 75230	B
Museum Arts, Inc.	2639 Freewood	Dallas	TX 75209	A
MX Contractors Inc	705 Glade Rd	Colleyville	TX 76034	A
Mycon General	10925 Estate Lane Suite 310	Dallas	TX 75238	A
Mycrosystems Marketing	660 International Pkwy Ste 120	Richardson	TX 75081	G
Myriad Software, Inc.	One West Lopp South Suite 100	Houston	TX 77027	A
N B S	PO Box 124/801 E 10th St	Borger	TX 79007	G
N.C. Sturgeon, Inc.	2800 SE Loop 820	Fort Worth	TX 76140	A
N/C Tech, Inc.	127A Leslie	Dallas	TX 75207	G
Nancy A. Gilliam	509 Edgefield	Garland	TX 75040	G
Nathan D Maier	8800 N Central Expwy Suite 300	Dallas	TX 75231	A
Nathelyne A. Kennedy &	6100 Hillcroft Suite 710	Houston	TX 77081	I
National Connect Tronix,	4801 Spring Valley Rd Suite 108B	Dallas	TX 75244	F
National Connect-Tronix	PO Box 800887	Dallas	TX 75380	F
National Decal &	2532 North Beckley Rd	Lancaster	TX 75134	A
National Distribution	1-35E & FM 387	Waxahachie	TX 75165	B
National Duct Systems Inc	1811 Trinity Valley Ste 100	Carrollton	TX 75006-6510	A
National Freight Inc	PO Box 664	Waxahachie	TX 75165	B
National Linen Service	620 Yorktown	Dallas	TX 75208	B
National Office & Filling	630 Texas Central Parkway	Waco	TX 76712	I
National Systems Group	630 Texas Central Parkway	Waco	TX 76712	I
National Welding Supply	P.O. Box 4709	Fort Worth	TX 76164-0709	A
National Wire & Cable	9858 Plano Rd Suite 100	Dallas	TX 75238	A
National/MTG Company	3408 Yale St	Houston	TX 77018	I
Nationwide Papers	2301 E Loop 820 North	Ft Worth	TX 76118	A
Nationwide Products, Inc.	4541 Ratliff Lane Suite 150	Dallas	TX 75248	G
Nationwide Real Estate	1003 Wirt Rd Ste 204	Houston	TX 77055	A
Navarro Sand & Gravel Inc	PO Box 19285	Dallas	TX 75219	A
NCR Information Imaging	3330 W Royal Lane	Irving	TX 75063	B
NDE, Inc.	P.O. Box 121326	Fort Worth	TX 76121	G
Neal & Associates, Div.	P.O. Box 550127	Dallas	TX 75355	A
Needham Wright Laskey	17120 Dallas Parkway Suite 130	Dallas	TX 75248	A
Neel Associates, Inc.	P.O. Box 20126	Waco	TX 76702-0126	G
Neil McMillan Movers	2017 Old Hickory Trail	De Soto	TX 75115	A
Nel-Mac Tooling &	911 Elm Street Suite B	McKinney	TX 75069	A
Nelson Coulson And	100 N Central #708	Richardson	TX 75080	G
Nesbitt Company Inc	6060 N Central Expwy #662	Dallas	TX 75206	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Nettech, Inc.	P.O. Box 50425	Dallas	TX 75202	F
Network General c/o Tiex	13748 Neutron Rd	Dallas	TX 75244	A
Network Security Uniform	PO Box 816127	Dallas	TX 75381-8167	F
Nevill Business Machines,	2707 Royal Lane	Dallas	TX 75229	B
Newark Electrpnics	707 Easy Street	Garland	TX 75042	B
Newcomb Spring Of	2831 Satsuma Dr	Dallas	TX 75229	A
Newton-Neroc	Po Box 3604	Temple	TX 76505	A
Nick's Printing Inc	3422 Doug Dr	Dallas	TX 75247	G
Nix Electric Company	110 North Sentry Dr	Mansfield	TX 76063-3608	A
NLS Industries, Inc.	P.O. Box 48040	Fort Worth	TX 76148-0040	A
NLS Industries Inc	6418 Wuliger Way	Ft Worth	TX 76180	A
Noise Control Technology	2331 Gus Thomasson #128	Dallas	TX 75228	A
Noreen Industrial	819 Office Park Circle	Lewisville	TX 75067	A
Norman George	Route3 Box 169X	Greenville	TX 75401	A
North American	P.O. Box 832686	Richardson	TX 75083-2686	A
North American Security	3500 Oak Lawn Suite 550 LB 50	Dallas	TX 75219	A
North Dallas United Van	P.O. Box 110336	Carrollton	TX 75011-0336	A
North Texas Bolt, Nut &	1502 109th Street	Grand Prairie	TX 75050	A
North Texas Casters	2536 N.E. Loop 820	Fort Worth	TX 76106	A
North Texas Plumbing Co	600 Six Flags Dr Ste 632	Arlington	TX 76011	A
North Texas Steel	PO Box 2497	Ft Worth	TX 76113	A
Northcreek Contractors,	1703 N. Peyco Suite H	Arlington	TX 76017-6701	A
Northern Imports Inc dba	11445 Emerald St	Dallas	TX 75229	A
Northfield Enterprises	P.O. Box 30487	Houston	TX 77290	A
Northstar Land Surveying	8301 Broadway Suite 420	San Antonio	TX 78209	I
NORTX DELIVERIES INC.	5724 Remington Circle #1722	Fort Worth	TY 76132	F
Notch & Associates	2603 Cypress Hills Court	Arlington	TX 76006-4006	A
NPS Industries, Inc.	10420 Metric Blvd	Austin	TX 78753	A
Nueces Reinforcing Steel	1711 Miles St	Houston	TX 77015-6396	D
Nurses Night & Day, Inc.	4310 Austin Street	Houston	TX 77004	I
Nurses Today, Inc.	9330 LBJ Suite 900	Dallas	TX 75243	G
NYNEX Business Center	1600 W. 7th Street Suite 100	Fort Worth	TX 76102	B
Nynex Business Centers	5470 LBJ Fwy Ste 100	Dallas	TX 75240	B
O'Brien Partnership	1250 Copeland Road Suite 750	Arlington	TX 76011	G
OAO Corporation	201 Main Street Suite 1700	Fort Worth	TX 76102	B
Oates Trucking	Rt 1 Box 59-3	Paradise	TX 76073	A
Occupational Hygiene, Inc.	P.O. Box 181796	Dallas	TX 75218	G
OCE Business Systems	2777 Stemmons Frwy Ste 1256	Dallas	TX 75207	B
ODeP Engineering, Inc.	5495 Beltline Rd 3rd Floor	Dallas	TX 75240	F
Office Communications	5001 LBJ Freeway Suite 700	Dallas	TX 75244	B
Office Interiors	6300 N Central Expwy Ste 211	Dallas	TX 75206	I
Oil City Iron Works, Inc.	909 South 12th Street P.O. Box 1560	Corsicana	TX 75110	B

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Olde Time Foods, Inc.	P.O. Box 561284	Dallas	TX 75356-1284	A
Oldham Lumber Co	324 S Hampton	DeSoto	TX 75115	A
Oldham Lumber Co	927 S Haskell/PO Box 26232	Dallas	TX 75226	A
Oliver R. Windham	1907 Cheryl Street	Arlington	TX 76013	A
Olmsted - Kirk Paper Co.	5416 Maple Ave.	Dallas	TX 75235	B
Olsen-Guerra Lumber	P.O. Box 111247	Houston	TX 77293	F
Olsten Services	2080 Hwy 360 Suite 250	Grand Prairie	TX 75050	B
Omniplan Inc	One Ferris Plaza 400 South Record	Dallas	TX 75202	B
On Video Inc	10110 Monroe Dr	Dallas	TX 75229	A
On Video Inc	10110 Monroe Dr	Dallas	TX 75229	A
Open Plan Contractors,	Rt. 1, Box 40	Grandview	TX 76050	A
Orendain Associates Inc	13601 Preston Rd Suite 106E	Dallas	TX 75240	F
Oriental Gasket and	10216 Denton Drive	Dallas	TX 75220	A
Oteiza/Troy Architects	11615 Forest Central Dr Ste 209	Dallas	TX 75243	F
Otis White Engineers, Inc.	P.O. Box 450826	Houston	TX 77245-0826	F
OTM Engineering Inc	3101 Bee Cave Rd Ste 325	Austin	TX 78746	A
OTM Engineering, Inc.	3101 Bee Caves Rd Suite 325	Austin	TX 78746	A
Overhead Door Company	2617 Andjon Dr	Dallas	TX 75220	A
Overstreet & Zerbach, Inc.	10238 Better Dr	Dallas	TX 75229	G
Owens & Associates	1245 Southridge Court #203	Hurst	TX 76053	F
Owens Corning Fiberglas	12750 Merit Ste 100	Dallas	TX 75251	B
Owens Fasteners &	P.O. Box 382162	Duncanville	TX 75138-2162	I
Oxford & associates, Inc.	4848 Loop Central	Houston	TX 77081	B
Ozarka Drinking Water Co.	4250 Cambridge Rd.	Ft. Worth	TX 76155	B
P.C. Construction, inc.	10455 North Central Expressway	Dallas	TX 75230	G
P & C Supply Inc	Po Box 2647	Amarillo	TX 79105	A
P D. Browne Company	P.O. Box 29187	Dallas	TX 75229	A
P D. Browne Company	P.O. Box 29187	Dallas	TX 75229	A
P & M Construction	1700 Coit Road Suite 290	Plano	TX 75075	A
P & P Personnel Services	P.O. Box 1252	Killeen	TX 76540-1252	A
P S Couriers Inc	570 E Dove Rd	Southlake	TX 76092	A
Pacer Lubricants	7401 Wallisville Rd/P.O. Box 15535	Houston	TX 77220-5535	B
Paco Pumps, Inc.	4677 Mint Way	Dallas	TX 75236	
Paladin Consulting, Inc.	12620 Hillcrest Rd #217	Dallas	TX 75230	A
Pallet Services, Inc.	P.O. Box 380442	Duncanville	TX 75138	A
Palomar Properties, Inc.	P.O. Box 5407	Arlington	TX 76005	A
Pansophic Systems, Inc.	290 East Carpenter Freeway #426	Irving	TX 75062	B
Paramount Moving and	PO Box 40	Lancaster	TX 75146	A
Park Central Blueprints Inc	12660 Coit Rd #204	Dallas	TX 75251	G
Parker & Associates	P.O. Box 1016	Stephenville	TX 76401	A
Parker-Shane Mfg Co	501 Ovilla Oaks	Ovilla	TX 75154	F
Parkway Communications	1200 Commerce Dr #110	Plano	TX 75093	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Parrish-Hare Electrical	PO Box 224107	Dallas	TX 75222-4107	A
Parson's Instrumentation &	PO Box 2069	Waxahachie	TX 75165	A
Parties Portable	716 S. Deerfield Cir	Arlington	TX 76015	F
Pat Abbott	Route 1 Box 69-1-A	Grandview	TX 76050	G
Patricia McNeil Delgado	2120-B W Braker Ln	Austin	TX 78758	G
Patricio Rocha's Trucking	2309 SE 14th ST	Grand Prairie	TX 75050	A
Patt Inc	1330 N Plaza Dr	Granbury	TX 76048	A
Paul S Unzicker Inc	8700 Stemmons Frwy Ste 400	Dallas	TX 75247	A
Pauluhn Electric	P.O. Box 1275	Pearland	TX 77588-1275	A
Payless BTY Supply	240 Crockett	BMT	TX 77701	A
Payless Cashways Inc	1340 Duncanville Rd	Duncanville	TX 75116	B
Payless Cashways Inc	1580 Hwy 157 N	Mansfield	TX 76063	B
PBS, inc.	701 Brown Street	Hearne	TX 77859	A
PDS Technical Services	P.O. Box 29187	Dallas	TX 75261-9820	B
Pear-Tec	PO Box 3408	Longview	TX 75606	A
Pearldrop Pit Services/dba	P.O. Box 6321	Tyler	TX 75711	A
Pedro SS Services, Inc.	2415 West 10th Street	Austin	TX 78703	I
Peerless Mfg Co	PO Box 540667	Dallas	TX 75354	A
Peerless Products Inc	3138 Quebec Ste #108	Dallas	TX 75247	A
Pelton Manufacturing &	200 Centre Dr Suite 15	Burleson	TX 76028	A
Pelton Marsh Kinsella	15303 Dallas Pkwy Ste 1075 LB 6	Dallas	TX 75248	A
Pelzel & Associates, Inc.	P.O. Box 160518	Austin	TX 78716	G
Pelzel & Associates, Inc.	P.O. Box 160518	Austin	TX 78716	I
Pendleton Photographics	3918 Ridgeoak Way	Dallas	TX 75244	G
Perez Communications	4221 Lisbon Street	Fort Worth	TX 76107	F
Perkin-Elmer Corporation	2201 N Central Expwy #105	Richardson	TX 75080	B
Perma Products Co	PO Box 763909	Dallas	TX 75376-3909	B
Personalized Business	PO Box 475	Glen Rose	TX 76043	G
Personnel Connection,	87011 Bedford-Euless Rd Suite 530	Hurst	TX 76053	B
Personnel Pool	One Summit Ave Ste 101	Ft Worth	TX 76102	B
Petro Rubber Products Inc	PO Box 1139	Joshua	TX 76058	A
Petrochem International	PO Box 35208	Dallas	TX 75235	A
Phase Electric Motors Inc	1105 South Cedar Hill Rd	Cedar Hill	TX 75104	A
PHH Environments	600 N Pearl	Dallas	TX 75201	A
Philatron International, Inc.	11632 Cedar Crest	El Paso	TX 79936	F
Philip G Puckett	9219 Katy Fwy #135	Houston	TX 77007	A
Phillip Williams	1225 E. Pleasant Run Road #2001	De Soto	TX 75115	C
Phillips Real Estate	Route 2 Box 102D	Venus	TX 76084	G
Phoenix Distributing, Inc.	3018 Ruder Street	Dallas	TX 75212	G
Phonefare Inc	PO Box 542	Duncanville	TX 75138	A
Photo Graphic Nelsons Inc	2493 Calder	Beaumont	TX 77702	A
Photos by Marty	922 Oak Park Drive	Dallas	TX 75232	F

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Super Office Store	P.O. Box 457	Addison	TX 75001	A
Superior Concrete Fence	PO Box 111255	Arlington	TX 76007	A
Superior Energies, Inc.	P.O. Box Drawer 386	Groves	TX 77619	A
Superior Messanger	1949 Stemmons Freeway Suite 660	Dallas	TX 75207	A
Superior Plastics	2412 Chester Street	Fort Worth	TX 76103	A
Superior Products Inc	2127 S Great SW Pky #201	Grand Prairie	TX 75051	A
Susan Elsner Public	4514 Cole Ave Suite 600	Dallas	TX 75205	G
Susan F. Sanders	2527 McKinney Ave	Dallas	TX 75201	G
Susan Office Systems	404 Walden Trail	Euless	TX 76039	G
Susan Office Systems	404 Walden Trail	Euless	TX 76039	G
Sutton Trucking Service	PO Box 41082	Dallas	TX 75241	F
Swieco Electronics Div Of	6428 Wuliger Way	North Richland	TX 76180	A
SWR Inc	PO Box 17387	Dallas	TX 75217	A
Sysco Food Services Of	PO Box 26004/6600 Tram Rd	Beaumont	TX 77720-6004	B
Sysco, Inc.	P.O. Box 26004	Beaumont	TX 77720-6004	B
SysComm Design Inc	1440 Empire Central Ste 125	Dallas	TX 75247	A
System Eng and	PO Box 1506	Amarillo	TX 79105	A
System Engineering &	Rt 7 Box 917	Tyler	TX 75707	A
Systems Management	16852 Royal Crest	Houston	TX 77058	F
Systems & Processes	1406 Smith Rd	Austin	TX 78721	A
T A Cunningham &	PO Box 560495	The Colony	TX 75056	A
T.C.R. , Inc.	5706 Airport Freeway	Fort Worth	TX 76117	A
T.F. Tigert Company, Inc.	2135 Industrial Street	Lancaster	TX 75134	A
T G Enterprises	P.O. Box 806	Rowlett	TX 75088	A
T Gray Electric Co Inc	3404 Jane Lane	Dallas	TX 75247	A
T & K Machine, Inc.	P.O. Box 1115	Paris	TX 75460	F
T & L Stamping Company	217 Yorktown	Dallas	TX 75208	G
T R Financial Services U S	6671 Southwest Frwy #501	Houston	TX 77074	I
T.R.M. Paint Contractors	P.O. Box 181	Laird Hill	TX 75666	A
T & S. Supply	7150 B. Baker Blvd.	Ft. Worth	TX 76118	A
T-J Electrical Company	P.O Box 171	Mound	TX 76558	G
T-K-O Equipment Co	2850 Hardrock Rd	Grand Prairie	TX 75050	A
TAC/Technical Assistance	4702 FM 1960 West Suite 285	Houston	TX 77069	A
TAD Technical Services	4001 Airport Fwy #150	Bedford	TX 76021	B
Tagan Construction, Inc.	P.O. Box 8596	Fort Worth	TX 76124-0596	B
Talem, Inc.	306 W. Broadway Ave	Fort Worth	TX 76104	A
Tan Tex Tile Company	P.O. Box 7117	Fort Worth	TX 76111	F
Tandy Electronics National	900 East Northside Dr	Fort Worth	TX 76102	B
TAP, Incorporated	2301 E. Lamar Blvd., #500	Arlington	TX 76006	A
Tapcon Inc	521 Shepherd	Garland	TX 75042	A
Tarmac Transporation Inc	3510 North Grove	Fort Worth	TX 76106	A
Tarwater/Southwest, Inc.	PO Box 1569	Fort Worth	TX 76101	G

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	CL
Tasco Tool Company	P.O. Box 121637	Fort Worth	TX 76116	A
Tax Doctors Inc	8080 Park Lane Ste 600	Dallas	TX 75231	F
Taylor & Hill Inc	9001 Airport #210	Houston	TX 77061	A
Taylor Lightning Protection	5330 East 5th Street Suite "C"	Katy	TX 77493	A
TCB Products Company	9241 LBJ Freeway Suite 100	Dallas	TX 75243	F
TDM Systems	Route 5 Box 5902	Palestine	TX 75801	A
TDM Systems	Route 5 Box 5902	Plaestine	TX 75801	G
Teaching Systems, Inc.	9050 Autobahn Dr Suite 100	Dallas	TX 75237	A
Teague Nall and Perkins,	915 Florence Street	Fort Worth	TX 76102	A
Tech Builders Inc	1610 West 2nd	Amarillo	TX 79106	A
Tech Design Inc	1701 N Greenville Ave #902	Richardson	TX 75081	A
Tech Spray Inc	PO Box 949	Amarillo	TX 79105	A
Techcor Construction, Inc.	3050 Regent Blvd Suite 100	Irving	TX 75063-3141	F
Technical Concepts	1200 South Sherman Suite 100	Richardson	TX 75081	A
Technical Hydraulic Inc	111 E Brown St	Ennis	TX 75119	A
Technical Planning	5471 Imogene St	Houston	TX 77096	A
Technical Programming	2995 LBJ Frwy Ste 211	Dallas	TX 75234	G
Technical Welding Lab.	2815 Lilac	Pasadena	TX 77503	F
Technical Welding	2815 Lilac	Pasadena	TX 77503	F
TechniStructures Inc	3500 Maple Ave #1475	Dallas	TX 75219	F
Technology & Testing	1043 Cypress Point	Mansfield	TX 76063	A
Ted S. Webb	6100 Western Place, Ste. 901	Fort Worth	TX 76107	A
Tee Torre	P.O. Box 214804	Dallas	TX 75221	G
Tegrus Construction Co	107 Executive Way	DeSoto	TX 75115	A
Tektronix, Inc.	P.O. Box 165027	Irving	TX 75016-5027	B
Tektronix, Inc.	1551 Corporate Drive	Irving	TX 75038	B
Telecom Electric Supply	2000 Ave G Suite 810	Plano	TX 75074	F
Telecom Specialists	110 North Loop	Houston	TX 77008	F
Telecommunication	49333 Tremont	Dallas	TX 75214	A
Teledyne Post	829 S 75th St	Houston	TX 77023	B
Telemarketing 4 U	4245 Phoenix Dr	Carrollton	TX 75010	G
Telesis High Vacuum Inc	10705 Plano Rd Ste 100	Dallas	TX 75238	A
Tellepsen Corporation	15600 West Hardy Rd	Houston	TX 77060	
Temp Associates, inc.	2505 N. Hwy 360 Suite 150	Grand Prairie	TX 75050	G
Temporaries Inc	1910 Pacific Ave #540	Dallas	TX 75201	B
Ten of Dallas	3168 Citation Drive	Dallas	TX 75229	G
Terminix International	PO Box 8762	Waco	TX 76714	A
Terra - Mar, Inc.	2679 Lombardy	Dallas	TX 75220	F
Terra-Mar, Inc.	2679 Lombardy	Dallas	TX 75220	F
Terry M Harden Architects	700 First City Bank Tower	Fort Worth	TX 76102	A
Tesco Products Co	PO Box 613	Bellville	TX 77418	A
Tesmec USA Inc	103 Sentry Dr North	Mansfield	TX 76063	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Testech Inc	401 International Parkway Ste 108	Richardson	TX 75081	A
Tex Con Utility Contractor	3925 Forest Lane	Garland	TX 75042	A
Tex-O-Cal Hardwoods Inc	PO Box 905	Tempie	TX 76503	A
Texas Best Sign Company	P Box 224032	Dallas	TX 75222-4032	F
Texas Best Sign Company	P.O. Box 224032	Dallas	TX 75222-4032	F
Texas Best Sign Company	P.O. Box 224032	Dallas	TX 75222-4032	F
Texas Commercial	2001 Reliance Pkwy Ste D	Bedford	TX 76021	A
Texas Contactor Plan	2510 National Dr	Garland	TX 75041	A
Texas Contractors	P.O. Box 710547	Houston	TX 77271	A
Texas Conveyor Controls,	P. O. Box 29585	Dallas	TX 75229	A
Texas Conveyor Controls,	P.O. Box 29585	Dallas	TX 75229	A
Texas Design Center	7841 Querida Ln.	Dallas	TX 75248	A
Texas Die Casting	600 South Loop 485/P.O. Box 71	Gladewater	TX 75647	A
Texas Electric Motors, Inc.	4060 Shilling Way	Dallas	TX 75237	A
Texas Forming Systems &	1306 West Oakdale	Grand Prairie	TX 75050	B
Texas Heat Treating, Inc.	303 Texas Ave.	Round Rock	TX 78664	A
Texas Ice Machine Co Inc	8911 Directors Row	Dallas	TX 75247	A
Texas Industrial Security	1 Summit Ave Suite 311	Ft Worth	TX 76102	G
Texas Industries Inc	7610 Stemmons Frwy	Dallas	TX 75247	B
Texas Industries Inc	PO Box 400	Arlington	TX 76010	B
Texas K-Span Structures	917 N Bowser	Richardson	TX 75081	A
Texas Lighting Sales	300 E Midway Place	Euless	TX 76039	B
Texas Lime Company	P.O. Box 851	Cleburne	TX 76033	B
Texas Lime Company	P.O. Box 851	Cleburne	TX 76033	B
Texas Material Handling,	P.O. Box 35775	Houston	TX 77235	A
Texas Mill Supply	200 Union Bower Ct #214	Irving	TX 75061	A
Texas Moving Co Inc	908 N Bowser Rd	Richardson	TX 75081	G
Texas Paper Express	P.O. Box 569	De Soto	TX 75115	A
Texas Paper & Ribbon Co	3131 Turtle Cr Blvd Ste 512	Dallas	TX 75219	G
Texas Plywood & Lumber	PO Box 531110	Grand Prairie	TX 75053	G
Texas Precision	PO Box 3640	Lubbock	TX 79452	A
Texas Rubber Supply Inc	PO Box 565067	Dallas	TX 75356	A
Texas Specialty	2877 LBJ Frwy #135	Dallas	TX 75234	G
Texas Sprinkler	7100 Acacia Drive	Leander	TX 78641	A
Texas Steel Culvert	P.O. Box 727	Arlington	TX 76004	A
Texas Valve & Fitting Co	11123 Shady Trail	Dallas	TX 75229	A
Texas Video Systems Inc	10217 Plano Rd	Dallas	TX 75238	G
Texas Welding Equipment	1820 Irving Blvd	Dallas	TX 75207	A
Texas World Video	2610 Garden Ridge Lane	Arlington	TX 76006	F
Texstar, Inc.	802 Avenue J East	Grand Prairie	TX 75053	B
Thane-Coat, Inc.	10400 Westoffice Drive #120	Houston	TX 77042	A
Thang Buu & Associates,	2323 S. Voss Suite 140	Houston	TX 77057	F

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Thang Buu & Assoicates	2323 S Voss Ste 140	Houston	TX 77057	F
The Aldinger Company	3800 San Jacinto	Dallas	TX 75204	A
The Bonnynook Bed &	414 West Main	Waxahachie	TX 75165	G
The Branding Iron	1 East James Street #3	Cleburne	TX 76031	G
The Buckstaff Company	4220 Beltwood Parkway Ste 101	Dallas	TX 75244	A
The Burke Company	1210 Ave J. East	Grand Prairie	TX 75052	B
The Cadence Group Inc	251 O'Connor Ridge Blvd #230	Irving	TX 75038	B
The Camera Shop, Inc.	3116 W. Sixth Street	Fort Worth	TX 76107	A
The Chickasaw	P.O. Box 731	Cedar Hill	TX 75104	I
The Chickasaw	P.O. Box 731	Cedar Hill	TX 75104	I
The CMC Group, Inc.	3444 Michael	Plano	TX 75023	A
The Color Lab, Inc.	4442 Lawnview Ave	Dallas	TX 75227	A
The Color Place Inc.	1330 Conant	Dallas	TX 75207	A
The Consumer	1024 East Broad Street Suite 201A	Mansfield	TX 76063	G
The Curtis Company	11520 N Central Expwy Ste 202	Dallas	TX 75243	A
The Eads Company	P.O. Box 36448	Houston	TX 77236-6448	A
The Exhibit Store, Inc.	10720 N. Stemmons	Dallas	TX 75220	A
The Frey Group	13355 Noel Rd Ste 1315	Dallas	TX 75240	A
The Gilley Company	2100 North Hwy 360	Grand Prairie	TX 75050	G
The Glidden Company	1900 Josey Ln	Carrollton	TX 75006	B
The Hargis Company, Inc.	1205 Washington Ave	Waco	TX 76701	A
The Healing Museum	2615 Waugh Dr Suite 143	Houston	TX 77006	F
The ICE Co Inc	PO Box 610583	DFW Airport	TX 75261-0583	A
The Inner Office	11020 Audelia, B. 201	Dallas	TX 75243	A
The "K" Way Equipment	PO Box 800	Palestine	TX 75082	B
The Koehler Company	1404 N Camp St/PO Box 431	Sequin	TX 78156-0431	A
The Lebow/McGee	200 Bryan Place	Cedar Hill	TX 75104	A
The Nay Co	PO Box 605	Waxahachie	TX 75165	A
The Office Of Graham	3015 Canton St Ste C	Dallas	TX 75226	A
The Paper Express	Po Box 569/1516 Osprey STe 204	DeSoto	TX 75115	A
The Perry Company	P.O. Box 7187	Waco	TX 76714	A
The Photography Studio	200 S Rogers Ste 303	Waxahachie	TX 75165	A
The Prescon Corp	1338 N W W White Rd Bexar County	San Antonio	TX 78219	B
The Print Shop	106 E. Henderson	Cleburne	TX 76031	G
The Production Group	210 Greensprings	Highland	TX 75067	A
The Relocation Center,	5215 North O'Connor Blvd., Suite	Irving	TX 75039	A
The Reynolds Company	140-B Regal Row	Dallas	TX 75356	A
The Reynolds Company	P.O. Box 569180	Dallas	TX 75356-9180	A
The Richey Co	1100 Grassere	Richardson	TX 75080	A
The Ridgemont Company	13720 Midway Rd Ste 109	Dallas	TX 75244	A
The Roosevelt Burrell	612 Grove Street	Fort Worth	TX 76102	F
The Semtner Companies	400 S Hall	Dallas	TX 75226	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
The Serco Company	5535 Redbird Center Dr #150	Dallas	TX 75237	A
The Snow Corporation	PO Box 9800	Fort Worth	TX 76147-2800	A
The Softsource	13621 Inwood Rd Suite 220	Dallas	TX 75244	N
The SoftSource	13621 Inwood Rd Ste 220	Dallas	TX 75244	N
The Southwell Co	PO Box 299	San Antonio	TX 78291	A
The Spencer Company	2811 McKinney Avenue Suite 350	Dallas	TX 75204	G
The Summit Group	1227 West Magnolia Suite 500	Fort Worth	TX 76104	A
The Sward Group	P.O. Box 671378	Dallas	TX 75367	A
The Telefone Company	959 East Collins Suite 135	Richardson	TX 75081	G
The Trident Company	PO Box 830026	Richardson	TX 75083-0026	A
The Typewriter Shoppe,	P.O. Box 651	Arlington	TX 76010	G
The W B Moore Co	10455 Olympic Dr	Dallas	TX 75220	N
The Wackenhut Corp.	2701 Ave. E. East, Suite 412	Arlington	TX 76011-5242	B
The Wells Group	1313 Slocum Drive #101	Dallas	TX 75207	A
The White Budd Van Ness	3040 Post Oak Blvd Ste 1770	Houston	TX 77056	A
The William Boyd Andrews	5200 Meadowcreek Dr #1049	Dallas	TX 75248	A
The Wilson Group	106 Dartmouth	Waxachie	TX 75165	A
The Zipkes Agency	5720 LBJ Freeway Ste 460	Dallas	TX 75240	A
Theis Construction	5300 39th Street	Groves	TX 77619-2912	A
Thermacor Process, Inc.	P.O. Box 79670	Fort Worth	TX 76179	A
Thermal Corporation	10500 Windfern Rd	Houston	TX 77064	A
Thomas & Betts	25025 I-45 North Suite 330	Spring	TX 77380	B
Thomas & Betts	25025 I-45 North Suite 330	Spring	TX 77380	B
Thomas Contract Furniture	1825 Market Center Blvd #370	Dallas	TX 75207	A
Thomas G Brown	Rt 1 Box 110	Terrell	TX 75160	F
Thomas Protective Service	302 N Hampton	DeSoto	TX 75115	G
Thomas Reprographics Inc	600 N Central Expwy	Richardson	TX 75080	A
Thornhill Ford-Mercury	Drawer 598	Waxahachie	TX 75165	A
Three Dallas	6311 North O'Connor Rd Lock Box	Irving	TX 75039	B
Threshold	PO BOx 1067	Amarillo	TX 79105	I
THT Sales Company, Inc.	13438 Floyd Circle	Dallas	TX 75243	A
Ticknor International	P. O. Box 13577	Arlington	TX 76094	A
Ticknor Rescue/EMS	3401 Bristol Rd	Arlington	TX 76013	G
Tide-Air Inc	2210 Hightower	Garland	TX 75041	B
Tiernan Aeration, Inc.	P.0. Box 7588	Amarillo	TX 79114	A
Tiex	13748 Neutron Rd.	Dallas	TX 75244	A
Tiger Paw of Dallas	2830 LBJ Freeway Suite 247	Dallas	TX 75234	A
Tim Bennett Engineers Inc	3925 Forest Lane	Garland	TX 75042	A
Tim Lanz	1950 Stemmons Suite 5001	Dallas	TX 75207	B
Tim Pulliam Concrete	2516 Minnis Dr Suite 130	Fort Worth	TX 76117	A
Timberline Constructors,	P.O. Box 1848	Lufkin	TX 75902-1848	A
Times-Review	108 South Anglin	Cleburne	TX 76031	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Tips Iron and Steel	PO Box 2003	Austin	TX 78768	A
Tire Team of Cleburne	2106 North Main	Cleburne	TX 76031	F
Titanium Industries	2005 108th Street Suite 502	Grand Prairie	TX 75050	A
TLC Manufacturing Inc	3500 Waco St	Texarkana	TX 75501-6499	A
TNG Inc	4001 Airport Freeway Ste 101	Bedford	TX 76021	Fo
Todd Mechanical Inc	Rt 2 Box 408	Alvarado	TX 76009	G
Tom Malone Architects,	3612 Matlock Rd Suite 150	Arlington	TX 76015	A
Tom's Mechanical, Inc.	525 North Great Southwest Parkway	Arlington	TX 76011	A
Tommy L. Newton	Box 3450	Hemphill	TX 75948	A
Tommy Murphy General	409 S. FM 551	Royse City	TX 75039	A
Tommy White Production	630 Collard Street	Fort Worth	TX 76103	A
Tony Pope	2254 Cedardale Rd	Lancaster	TX 75134	A
Toshiba	13131 West Little York Rd	Houston	TX 77041	B
Trac-Work Inc	PO Box 550	Ennis	TX 75120	A
Trans-National Leasing,	P.O. Box 802615	Dallas	TX 75380-2615	A
Trans-State Industries Inc	311 RR 620 South Box 167	Austin	TX 78734	A
Transet Company	P.O. Box 2861	Longview	TX 75606	A
Transpec Fasteners	1500 North Park Suite 150	Fort Worth	TX 76102	F
Tratech Manufacturing	P.O. Box 225394	Dallas	TX 75222-5394	F
TRB Co	3786 Townsend	Dallas	TX 75229	G
TRC Temporary Service	1601 Elm St Suite 1740	Dallas	TX 75201	A
Trees Machinery Co	3306 Walnut Ste 407	Garland	TX 75042	A
Trego Industries Inc	PO Box 85	Red Oak	TX 75154	A
Trencor Jetco Inc	3545 E Main St	Grand Prairie	TX 75050	B
Tri-County Welding	200 West Bridge	Granbury	TX 76048	G
Triad Protective Services,	2860 LBJ Freeway Suite 220	Dallas	TX 75234	G
Triangle Equipment, Inc.	1495 Lindbergh Dr	Beaumont	TX 77707	A
Triangle Plastering Co Inc	PO Box 38325	Dallas	TX 75238	A
Triangle Plastics	3923 Morse Street #112	Denton	TX 76205	A
Tricon Tool & Supply, Inc.	5809 Clinton Drive	Houston	TX 77020	A
Trigg Company, Inc.	P.O. Box 92099	Houston	TX 77206	A
Trinity Contractors Inc	2425 Dillard St	Grand Prairie	TX 75051	B
Trinity Contractors Inc	PO Box 6278	Arlington	TX 76005	B
Trinity Industries Inc	2525 Stemmons Fwy	Dallas	TX 75207	A
Trinity Office Sply	2837 S Cravens Rd	Ft Worth	TX 76119	A
Trinity Technology, Inc.	1010 Sterling Plaza/5949 Sherry	Dallas	TX 75225	G
Triple T Transfer	4650 S. Treadway	Abilene	TX 79602	A
Triton Electronics	2020 East St. Elmo Rd.	Austin	TX 78744	F
TRM Paint Corporation	PO Box 181	Laird Hill	TX 75666	A
TRM-The Real McCoy	3353 Lombardy Lane #1106	Dallas	TX 75220	F
Trojan Electric Inc	1206 California Ln #106	Arlington	TX 76015	F
TSI Engineering Inc	7200 Midway Rd/PO Box 820629	Ft Worth	TX 76182-0629	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Tubesales	PO Box 530010	Grand Prairie	TX 76053	B
Tubex Corporation	613 South 4th	Mansfield	TX 76063	A
Tucker Enterprises	18909 Lloyd Circle #1111	Dallas	TX 75252	F
Tucker Oil Company	P.O. Box 252	Hutchins	TX 75141	A
Tucker's Earth Haulers,	11500 Mosier Valley Road	Euless	TX 76040	F
Tufco Ready Mix Inc	Rt 2 Box 159 H	Waxahachie	TX 75165	G
Tumac Wood Components	9901 E Valley Ranch Pkwy #2080	Irving	TX 75063	A
Turnkey Meeting Planners	8404 Forest Lane No. 102	Dallas	TX 75243	G
Twyford Painting &	14 El Dorado	Friendswood	TX 77546	A
Tyler Fertilizer Co	420 S Oakland	Tyler	TX 75702-8292	A
TYMCO Inc.	P.O. Box 2368, 225 E. Industrial Blvd	Waco	TX 76703-2368	G
Tymco Incorporated	P.O. Box 2368/ 225 East Industrial	Waco	TX 76703-2368	G
Typeset Inc	500 S. Good Latimer	Dallas	TX 75245	A
Typeworks of Dallas, Inc.	2905 Maple Avenue	Dallas	TX 75201	A
Typeworks Of Dallas Inc	2905 Maple Ave	Dallas	TX 75201	A
U.S. Biomedical Products,	11632 Cedarcrest	El Paso	TX 79936	I
U.S. Instruments Rentals,	P.O. Box 610408	DFW Airport	TX 75261	B
U S Intec Inc	PO Box 2845/1212 Brai Dr	Port Arthur	TX 77643	B
UCMI	9502 Springdale Rd	Austin	TX 78754	I
Ultimate Printing Center	14580 Beltwood Suite 101	Dallas	TX 75244	F
Ultrasonic Research &	2029 Farrington	Dallas	TX 75207	A
Unibind North Texas	5301 Miller Rd	Rowlett	TX 75088	A
Unicap Documentation	PO Box 743066	Dallas	TX 75374-3066	F
Uniflux	2331 Gus Thomasson #128	Dallas	TX 75228	A
Uniforms, Incorporated	406 West Mockingbird	Dallas	TX 75247	A
Uniglobe Clocktower	1619 N Hampton Ste 120	DeSoto	TX 75115	G
Uniglobe Uptown Travel	2651 N Harwood Ste 150	Dallas	TX 75201	G
Union Sling Company	3021 Pluto St	Dallas	TX 75212	A
Unique Idea Paint	P.O. Box 9111	Amarillo	TX 79105	F
Unique Transporation	802 N Kealy	Lewisville	TX 75067	G
Unique Video Productions,	P.O. Box 763400	Dallas	TX 75376	I
Unistrut Texas	3315 E. Randol Mill Rd.	Arlington	TX 76011	B
Unistrut Texas	3315 E. Randol Mill Rd	Arlington	TX 76011	A
Unit Distribution Of Texas	2050 Kestrel Ave.	DeSoto	TX 75115	A
Unitech Technology, Inc.	1025 Trend	Carrollton	TX 75006	F
United Contractors	P..0. Box 4017	Amarillo	TX 79116	A
United Fleet Equipment	PO Box 29098	Dallas	TX 75229-0098	A
United Interior	333 Adair Sttreet	Dallas	TX. 75246	A
United Mechanical	PO Box 551206	Dallas	TX 75355-1206	A
United Medical Supply,	5117 Northeast Parkway	Ft. Worth	TX 76106	A
United Metal Fabrication,	P.O. Box 567609	Dallas	TX 75356-7609	A
United Pump Supply Inc	10931 Dennis Rd	Dallas	TX 75229	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Steelman Industries Inc	PO Box 1461/2706 Hwy 135 North	Kilgore	TX 75662-1461	A
Steelman Industries, Inc.	P.O. Box 1461/2706 Highway 135	Kilgore	TX 75662-1461	A
Steelshaver Machine Co	201-C East Brown St/PO Box 1078	Ennis	TX 75119	A
Sterling Electronics	P.0 Box 29317	Dallas	TX 75229	A
Sterling Steel Company	2001 Brittmoore	Houston	TX 77043	B
Steve Dunn & Partners	2520 Fairmount	Dallas	TX 75201	B
Steve Leary	5422 Farquhar	Dallas	TX 75209	A
Steve Moore	5423 Peterson Lane Apt. 209	Dallas	TX 75240	A
Steve Zhanel Entreprises	911 N Peak st	Dallas	TX 75204	A
Stewart Contract Interiors	3232 McKinney Ave Ste 1100 LB 48	Dallas	TX 75204	A
Stewart Wattley Material	3730 Forest Lane	Garland	TX 75042	F
STI Manufacturing Group,	2617 Manana Drive	Dallas	TX 75220	I
Stinson Construction, Inc.	1812 E. Poly Webb Rd	Arlington	TX 76018	I
Stock Alloys, Inc.	4600 South Pinemont	Houston	TX 77041	A
Stokes Vacuum, Inc.	10620 Control Place	Dallas	TX 75238	B
Stone & Webster	400 N Olive St LB 18	Dallas	TX 75201	B
STOR-A-FILE, Inc.	P.O. Box 567	Waco	TX 76703	I
Stor-A-File, Inc.	P.O. Box 567	Waco	TX 76703	I
Storage & Retrieval	PO Box 270435	Dallas	TX 75227	A
Strand Systems	2964 LBJ Freeway Ste 312	Dallas	TX 75234	A
Strickland Building	PO Box 7038	Amarillo	TX 79114	A
Stringer Welding	4406 Indian Oaks Trail	Arlington	TX 76017	B
Structural Metal Inc	PO Box 911	Seguin	TX 78156	B
Structural & Steel	1320 S University Dr Ste 701	Ft Worth	TX 76107	A
Stuart C. Irby Co.	4610 McEwen Rd.	Dallas	TX 75244	B
Style Enterprises	321 Main St	Ranger	TX 76470	A
Sue Wade & Associates,	2911 Turtle Creek Blvd LB412	Dallas	TX 75219	G
Suite Software	5215 N O'Conner	Irving	TX 75039	A
Sullivan & Associates	4144 N. Central Expwy. Suite 660	Dallas	TX 75204	A
Sullivan Group	5000 Quorum Dr Ste 517	Dallas	TX 75240	A
Summers Electric	4601 Spring Valley	Dallas	TX 75244	B
Summit Controls, Inc.	720 Avenue F Suite 108	Plano	TX 75074	A
Summit Sales Company	415 Regal Row	Dallas	TX 75247	A
Sun Belt Electrical	2877 LBJ Frwy #180	Dallas	TX 75234	A
Sun Masters Inc	2001 Midway Ste 122	Carrollton	TX 75006	G
Sun Microsystems	14785 Preston Rd Suite 1050	Dallas	TX 75240	B
SunarHauserman	20 Greeway Plaza Ste 660	Houston	TX 77046	B
Sunbelt Industrial Trucks	601 E Walnut	Garland	TX 75040	A
Sunbelt Specialized	104 W Hwy 180	Roby	TX 79543	A
Sunset Transportation	PO Box 820613	Ft Worth	TX 76182-0613	G
Sunshine Sales	Box 131	Corsicana	TX 75151	A
Super Cool Mechanical &	5807 Little York Rd	Houston	TX 77016	F

TEXAS
FIRMS INTERESTED IN SSCL BUSINES

COMPANY	ADDRESS	CITY	STAT
United Services Company	6815 LaVioletta	Houston	TX 77
United Structures Of	1912 Buschong	Houston	TX 77
United Welding	4774 Algiers St	Dallas	TX 75
Universal Fire Equipment	11624 Chairman Dr	Dallas	TX 75
Universal Manufacturing	900 South Cedar Ridge Road	Duncanville	TX 75
Universal Printing	115 Executive Way Suite 212	De Soto	TX 75
Universal Transformer	P.O. Box 1300	Wylie	TX 75
University Computers	100 N. University Dr., #137	Fort Worth	TX 761
University of Central Texas	PO Box 1416	Killeen	TX 76
Unlimited Sources	1312 West Main Suite 10	Waxahachie	TX 751
US Brick	840 Greenview Dr	Grand Prairie	TX 75
US Courier Inc	10460 Shady Trail #10	Dallas	TX 752
US Digital Corp	2035 Royal Ln Ste 200	Dallas	TX 752
US Robotech, Inc.	3608 Falcon Drive	Fort Worth	TX 761
US Sprint	1520 E. Rochelle Blvd	Irving	TX 75
USA Datafax, Inc.	1819 Firman Dr., # 115	Richardson	TX 752
USSI Inc	2710 Stemmons Frwy 700 North	Dallas	TX 752
Utility Engineering Corp	6th Tyler PO Box 12033	Amarillo	TX 791
Utility Engineering	P.O. Box 12033	Amarillo	TX 791
V.C.P. International, Inc.	P.O. Box 550999	Dallas	TX 753
V.I.P. Employment	P.O. Box 8942	Midland	TX 797
V & V Auto Supply	843 N Hampton	DeSoto	TX 751
Vaden Architectural	P.O. Box 70	Joshua	TX 760
ValCom Computer Center	4100 Amon Carter Blvd	Ft Worth	TX 761
Vallen Safety Supply	1545 Capital Drive Suite 100	Carrollton	TX 750
Vallen Safety Supply	1545 Capital Dr Ste 100	Carrollton	TX 750
Vanderburg Drafting	PO Box 810438	Dallas	TX 753
VanGuard Security Inc	2860 Walnut Hill Ln Ste 120	Dallas	TX 752
Vantran Electric	P.O. Box 20128	Waco	TX 767
Vantran Electric	P.O. Box 20128	Waco	TX 767
Vantran Electric	P.O. Box 20128	Waco	TX 767
Vaporphase	2331 Gus Thomasson #128	Dallas	TX 752
VCA Teletronics	1801 Royal Lane Ste 1010	Dallas	TX 752
VCM, Inc.	14679 Midway Rd Suite 206	Dallas	TX 752
VCP International	2285 Merrit Dr	Garland	TX 750
VEI, Inc.	2711 LBJ Freeway Suite 210	Dallas	TX 752
Venture Engineering Inc	1313 Valwood Pkwy Ste 150	Carrollton	TX 750
Venus Construction	P.O. Box 90	Mansfield	TX 760
Venus Incorporated	5800D Camp Bowie Blvd	Fort Worth	TX 7
Verna's Venture	1427 Quartet	Dallas	TX
Versatile Machining, Inc.	7450 Tower Street	Fort Worth	T
Veselka Engineering	202 E.Border Suite 300	Arlington	

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Via NDT Engineering &	1003 Lakeside Drive	Channelview	TX 77530	A
Victory Contracting Inc	PO Box 453	Wallis	TX 77485-0453	G
Vidaud & Associates Inc.	5220 Spring Valley Rd Suite 605	Dallas	TX 75240	F
Vidicomp Distributors, Inc.	16219 North Freeway	Houston	TX 77090	F
Vigil & Associates	1515 West Sixth Street	Austin	TX 78703	A
Vikimatic Sales, Inc.	3018 Ruder Street	Dallas	TX 75212	A
Villarreal Electric Co., Inc.	P.O. Box 760	Laredo	TX 78042-0760	F
Villy Djerf	PO Box 625	Canton	TX 75103	A
Viran Systems, Inc.	5910 North Central Expressway Suite	Dallas	TX 75206	F
Vision Built, Inc./dba	260 Dividend	Midlothian	TX 76065	A
Visions In Action	P.O. Box 1723	Arlington	TX 76004	G
Vista Air Service Inc	5425 Brookfield	Houston	TX 77045	G
Vista Technology, inc.	7700 Alabama Suite C	El Paso	TX 79904	F
Vista Tecnology Inc	PO Box 640090	EL Paso	TX 79904	F
Vivid Enterprises	6911 Cliffwood Drive	Dallas	TX 75237	F
VME Laboratories, Inc.	1418 Upfield Dr	Carrollton	TX 75006	A
VMW Industries	P.0. Box 1939	Victoria	TX 77902	A
VMW Industries, Inc.	P.O. Box 1939	Victoria	TX 77902	A
Voiceshare of Texas	P.O. BOX 810660	Dallas	TX 75381-0660	A
Volt Technical Services	10210 N. Central Expressway Suite	Dallas	TX 75231	B
Vrana Welding And Fence	Rt 3 Box 135K	Ennis	TX 75119	F
W.A.L. Supply Company,	P.O. Box 8126	Ennis	TX 75120	F
W.A. Tayloe Company, Inc.	P.O. Box 59226	Dallas	TX 75229	A
W A Taylor Co Inc	PO Box 59226	Dallas	TX 75229	A
W.B. Grier Advertising &	P.O. Box 52800	Houston	TX 77052	I
W.E. Darden Building	200 Otis Dr/P.O. Box 20125	Waco	TX 76702	G
W.F. Barstow Machinery	9620 Chartwell Drive	Dallas	TX 75243	A
W. F. Carter Construction,	5809 East Berry Street	Fort Worth	TX 76119	A
W R Lawson Office	138 N 8th St/PO Box 216	Midlothian	TX 76065	A
W R Meadows Of Texas	PO Box 7752	Ft Worth	TX 76111	A
W.S.C Builders Inc.	14200 Midway Rd. #105	Dallas	TX 75244	A
W T S Enterprises Inc	4201 Diplomacy Rd	Ft Worth	TX 76155	A
W W Cannon, Inc.	P.O. Box 540006	Dallas	TX 75354	A
W W Grainger Inc	4101 Bronze Way	Dallas	TX 75237	B
W-T Inc	PO Box 459	Karnes City	TX 78118	A
Waco Mechanical Inc	PO BOx 23432	Waco	TX 76702-3432	G
Waco Ready Mix Concrete	PO Box 705	Waco	TX 76703-0705	B
Waggoner Personnel Inc	PO Drawer 3018	Corsicana	TX 75151	G
Waggoner Plastics, Inc.	P.O. Box 531649	Grand Prairie	TX 75053	A
Waits Bicycle Shop	1701 North Main	Cleburne	TX 76031	A
Walden Machine	Route 1 Box 263-C	Kilgore	TX 75662	A
Walker Building	P.O. Box 820217	Fort Worth	TX 76182-0217	F

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Walker Engineering, Inc.	10999 Petal Street	Dallas	TX 75238	B
Wallace & Associates	2609 Riveroaks Dr	Arlington	TX 76006-3639	A
Wallace Electronics, Inc.	10551 Miller Rd Suite 100	Dallas	TX 75238	A
Wallace Winkler & Rice Inc	PO Box 22007	Waco	TX 76702-2007	A
Walter P Moore and	3131 Eastside Second Floor	Houston	TX 77098	B
Walter P. Moore &	600 East John Carpenter Freeway	Irving	TX 75062	B
Wamaco Corporation	2427 Westwood	Mesquite	TX 75150	A
Wang Laboratories, Inc.	5429 LBJ Freeway Suite 900	Dallas	TX 75240	B
Wani & Associates Inc	801 Ave "H" E Suite 101	Arlington	TX 76006	F
Ward Pump Sales	6400 W Poly Webb	Arlington	TX 76016	A
Warnick Construction, Inc.	4018 Clay Avenue	Fort Worth	TX 76117	A
Warren Enterprise Inc	1512 Osprey Ste 106	DeSoto	TX 75115	A
Warren G Harding &	1013 Demark	Grand Prairie	TX 75050	A
Washburn Corner Stone	3209 Brenda	Burleson	TX 76028	A
Washington Tradewind	P O. Box 60238	Houston	TX 77205	F
Washington's Patrol	6080 Park Lane #600	Dallas	TX 75043	F
WaterFurnace Of Texas	PO Box 152342	Arlington	TX 76015	A
Watkins Construction	PO Box 570	Corsicana	TX 75151	A
Watson Brick Co	PO Box 6452	Tyler	TX 75711	A
Watson Distributing	P.O. Box 36211	Houston	TX 77236-6211	A
Watson Electric Supply Co	320 S Walton St/PO Box 26406	Dallas	TX 75226	A
Watson & Son Doormat	130 Williams Ave	Cleburne	TX 76031	!
Watts Drilling Co	Rt 5 Box 265-W	Ft Worth	TX 76126	A
Waxahachie Building Sply	410 S Rogers	Waxahachie	TX 75165	A
Waxahachie Equip Co Inc	209 S Waco Hwy	Waxahachie	TX 75165	F
Way Engineering	P.O. Box 36530	Houston	TX 77061	B
WBM Building	3211 Jack Cook Drive	Austin	TX 78723-3336	F
Weaver Studio	319 Ash	Lockhart	TX 78644	I
Webb, Murray &	1730 NASA Rd One, Suite 202	Houston	TX 77058	A
Webb Overhead Door	2200 E. Randoll Mill Road	Arlington	TX 76011	A
Weco Engineering	406 Erie Street	Cleburne	TX 76031	G
Weiser Security Services	1425 Greenway Ste 501	Irving	TX 75038	B
Welder & Industrial	P.O. Box 10	Midlothian	TX 76065	A
Wells Fargo Alarm	6221 N O'Connor Rd #121	Irving	TX 75039	B
Wendell B. Watson	1601 Random Rd.	Carrollton	TX 75006	F
Wendy Lopez &	9696 Skillman Suite 270 LB 10	Dallas	TX 75243	!
WESCO/Westinghouse	PO Box 222129	Dallas	TX 75222	B
West Texas Contractors	PO Box 19545	Amarillo	TX 79114	F
West Texas Engine Co	903 Arlington St	Wellington	TX 79095	A
West Texas Micromart	3003 S. Danville	Abilene	TX 79605	G
West Wind Tours Inc	207 S Cedar Ridge	Duncanville	TX 75116	A
Western Excavation	PO Box 1452	Midlothian	TX 76065	F

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Western Group	800 Wilcrest Drive Suite 100	Houston	TX 77042	F
Western Microtechnology	2545 Tarpley Rd	Carrollton	TX 75006	B
Western Power	9320 S R L Thornton Fwy #600	Dallas	TX 75232-5740	I
Western Reclamation	11223 B Plano Rd	Dallas	TX 75243	A
Westheimer Rigging &	117 Eastwood Street	Houston	TX 77011	A
Westmont Products	P.O. Box 224049	Dallas	TX 75222-4049	B
Weston Brothers Software,	2695 Villa Creek Suite 155	Dallas	TX 75234	A
WGD International	10101 Southwest Freeway Suite 400	Houston	TX 77074	F
Wharton & Lam Architects	215 Arnold Avenue	Arlington	TX 76010	A
Whisler Photography	5306 Stagecoach Lane	Garland	TX 75043	A
White Rock Electric Supply	PO Box 540516	Dallas	TX 75354	A
White Rock Electric Supply	PO Box 540516	Dallas	TX 75354	A
White & White Roads, Inc.	P.O. Box 450826	Houston	TX 77245-0826	F
WhiteGMC Trucks Of	PO Box 21127	Houston	TX 77226	B
Whitson & Company	840 Avenue F, Suite 103	Plano	TX 75074	B
WHM Transportation	2414BC Exposition Blvd Suite 230	Austin	TX 78703	A
Wholesale Electronic	2809 Ross Ave	Dallas	TX 75201	A
Wier & Associates Inc	4300 Beltaway Place Ste 130	Arlington	TX 76018-1097	A
Wilkins & Associates	2600 Avenue K Suite 237	Plano	TX 75074	F
Willard Boswell Co Inc	PO Box 2425	Grand Prairie	TX 75053	I
Willard Grain & Feed, Inc	Rt 2, Box 41	Celina	TX 75009	G
Willard Grain & Feed, Inc	Rt. 2, Box 41	Celina	TX 75009	G
William C Scarmardo	2108 Maloney	Bryan	TX 77805	F
William C Scarmardo	2108 Maloney	Bryan	TX 77805	F
William Leslie &	1350 Manufacturing Suite 120	Dallas	TX 75207	A
Williams and Company,	5052 Sharp Street	Dallas	TX 75247	B
Williams Office Products	2330 Merrell Rd	Dallas	TX 75229	A
Wilson Business Products	1450 Regal Row	Dallas	TX 75247	A
Wilson Company	PO Box 217	Addison	TX 75001	A
Wilson Snyder, Defense	4040 Forest Lane	Garland	TX 75042	B
Window Visions	211 W Jefferson	Waxahachie	TX 75165	A
Windward, Ltd.	11350 Luna Rd	Dallas	TX 75229	B
Windy Acres Farm	Box 37 - A	Vega	TX 79092	A
Winslow Agency	7929 Brookriver Dr Ste 100	Dallas	TX 75247	F
Wire-All Electric	3336 East Illinois	Dallas	TX 75216-3709	A
Wise Designs	P.O. Box 121542	Arlington	TX 76012	I
Wiseman Hardware	233 N Hampton	DeSoto	TX 75115	A
Witch Equipment Co Inc	343 North Bowen Rd	Arlington	TX 76012	A
Witter Mfg Inc	702 Avenue R	Grand Prairie	TX 75050	F
WMPC dba Getz Pest	11142 Shady Trail	Dallas	TX 75229	B
Womack Machine Supply	6015 Wyche	Dallas	TX 75235	A
Woodmark International	PO Box 831268	Richardson	TX 75083-1268	A

TEXAS
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Words To Go, Inc.	10555 N.W Fwy. # 279	Houston	TX 77092-8902	G
Work Wear	11445 Emerald St	Dallas	TX 75229	A
World Of Green Inc	421 Crowley Rd	Arlington	TX 76012	A
World Supply, Inc	P.O. Box 34396	Houston	TX 77234	G
Wormald Fire Systems,	151 Regal Row #118	Dallas	TX 75247	B
Worth Bindery	2520 White Settlement Rd	FT Worth	TX 76107	A
Worth Blake & Associates	Interfirst Place 8445 Freeport Pkwy	Irving	TX 75063	A
WPC Companies	1915 Peters Rd #207	Irving	TX 75061	A
WPC Companies	1915 Peters Rd., #207	Irving	TX 75061	A
WPT inc	2215 N. Olive Street	Dallas	TX 75201	F
WRA Architects Inc	7557 Rambler Rd #400	Dallas	TX 75231	A
WSC Builders Inc	14200 Midway Rd #105	Dallas	TX 75244	A
WTP Inc Architects &	2215 N Olive St Suite 200	Dallas	TX 75201	F
WTS Enterprises Inc	4201 Diplomacy Rd	Ft Worth	TX 76155	A
X-Press Hardware &	8310 Kensington Dr	Rowlett	TX 75088	G
Xerox Business Services	2245 Midway Road	Carrollton	TX 75006	B
Yates Construction Inc	PO Box 669	Marshall	TX 75071	A
YD Associates	4340 N. Central Expressway #100	Dallas	TX 75206	I
Yoko Trucking	PO Box 210166	Dallas	TX 75211	G
York Pump & Equipment,	P.O. Box 3939	Longview	TX 75606-3939	A
Young Brothers inc	PO Drawer 1800	Waco	TX 76703	B
Young Enterprises Inc	PO Box 517	Sherman	TX 75091	B
Young Equipment	PO Drawer 1800	Waco	TX 76703	B
Youngblood Architects Inc	301 Commerce St Ste 1010	Ft Worth	TX 76102	A
Zack Burkett Co	Po Box 40	Graham	TX 76046	B
Zamora Associates Inc	11615 Forest Central Dr Suite 217	Dallas	TX 75243	F
Zap! Action Products	P.O. Box 226095	Dallas	TX 75222-6095	G
Zaxon Inc.	5304 Pampas Court	Arlington	TX 76018	F
ZAXON, INC.	5304 Pampas Court	Arlington	TX 76018	F
Zea Manufacturing Co	Po Box 645	DeSoto	TX 75115	B
Zeno Systems Inc	1330 Capital Parkway	Carrollton	TX 75007	B
Zentex	P.O. Box 420494	Houston	TX 77242-0494	F
Zep Manufacturing	525 Centre Park Blvd	DeSoto	TX 75115	B
Zero Corporation	9858 Plano Rd Suite 100	Dallas	TX 75238	B
Zeus Components, Inc.	1800 North Glenville Dr Suite 120	Richardson	TX 75081	A
Zidell Valve Corporation	10410 Papalote St Ste 100	Houston	TX 77041	B
Zimmerman Sons &	P.O. Box 607	Cleburne	TX 76033	A
ZTI Industries, LTD	2100 North Greenville Ave	Richardson	TX 75082	A

VIRGINIA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Blueridge Technologies,	P.O. Box 430	Flint Hill	VA 22627-0430	A
Canon USA Inc/Gov	5701 General Washington dr	Alexandria	VA 22312-2488	B
Computer Sciences	3160 B. Fairview Park Drive	Falls Church	VA. 22042	B
Contract Technical	PO Box 12177	Newport News	VA 23612	A
Electronic Warfare	2071 Chain Bridge Road	Vienna	VA 22182	B
General Analytical	7918 Jones Branch Drive Suite 340	McLean	VA 22102-3307	F
Hoppman	14560 Lee Rd	Chantilly	VA 22021	A
Meta	2000 N. 14th, Suite 450	Arlington	VA 22201	I
Native American	1001 N. Highland Street	Arlington	VA 22201	F
Network Solutions, Inc.	505 Huntmar Park Drive	Herndon	VA 22070	F
Reynolds Metals Company	6601 West Broad Street	Richmond	VA 23261	B
Scheduled Airlines Traffic	1005 N Glebe Rd	Arlington	VA 22209	B
UTD Incorporated	8560 Cinderbed Rd Suite 1300	Newington	VA 22122	A
Wackenhut Applied	10530 Rosehaven Street Suite 500	Fairfax	VA 22030	B

WASHINGTON
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Electronic Specialty Corp	PO Box 3501	Vancouver	WA 98668-3501	F
John Fluke Manufacturing	P.O. Box 9090	Everett	WA 98206-9090	B
KJM & Associates, Ltd.	500 108th Avenue NE Suite 960	Bellevue	WA 98004	D
Losinger USA, Inc.	10900 NE 8th Street Suite 500	Bellevue	WA 98004-4405	B

WEST VIRGINIA
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP	C
Zeni Drilling Co	RD #13 Box 100 Rt 19 N	Morgantown	WV 26505	B

FRENCH
FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	PARRISH & ZIP
CERCA	9-11 rue Georges Enesco	Creteil	France 94008

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FIRMS INTERESTED IN SSCL BUSINESS

COMPANY	ADDRESS	CITY	STATE & ZIP
Baker Manufacturing	133 Enterprise Street	Evansville	WI 53536
Classic Modular Systems	1911 Columbus St	Two Rivers	WI 54241
Data Retrieval Corporation	11801 West Silver Spring Drive	Milwaukee	WI 53225
Harnischfeger Industries,	P. O. Box 554	Milwaukee	WI 53201
Lavelle Industries, Inc.	665 McHenry Street	Burlington	WI 53105
Meltric Corporation	6212 Ace Industrial Drive	Cudahy	WI 53110
Quality Management	1528 Ballard Rd	Appleton	WI 54911
Super Steel Products	7900 W Tower Ave	Milwaukee	WI 53223

Question: For each state, show, for FY 1990 -- universities receiving SSC funding and the amount.

Answer: I will be pleased to provide this information on funding to date for FY 1990 for the record. (The information follows:)

STATE	UNIVERSITES	CITY	FY90 $
Alabama	U. Alabama	Tuscaloosa	75000
total			75000
Arizona	U. Arizona	Tucson	84970
total			84970
California	Cal Tech	Pasadena	125000
	UC Davis	Davis	108000
	UCLA	Los Angeles	347000
	UC Santa Cruz	Santa Cruz	380000
	UC San Diego	San Diego	150000
total			1110000
Colorado	U. Colorado	Boulder	73000
total			73000
Connecticut	Fairfield	Fairfield	30000
	Yale	New Haven	125000
total			155000
Florida	Florida State	Tallahassee	203600
	U. Florida	Gainsville	286435
total			490035
Hawaii	U. Hawaii	Honolulu	64000
total			64000
Illinois	Northern Illinois	Dekalb	40000
	U Illinois	Chicago	10000
	U. Illinois	Urbana	380000
total			430000
Indiana	Indiana U.	Bloomington	351000
	Notre Dame	South Bend	80000
	Purdue	W. Lafayette	91000
total			522000
Iowa	Iowa State U.	Ames	10000
total			10000
Louisiana	LSU	Baton Rouge	45300
total			45300
Maryland	Johns Hopkins	Baltimore	30000

	U. Maryland	College Park	45000
total			75000
Massachusetts	Boston U.	Boston	494000
	Brandeis U.	Waltham	56653
	Harvard	Cambridge	199000
	MIT	Cambridge	1172000
	Northeastern U.	Boston	75000
total			1996653
Michigan	U. Michigan	Ann Arbor	225300
	Michigan State	E. Lansing	65000
total			290300
Minnesota	U. Minnesota	Minneapolis	115000
total			115000
Mississippi	U. Mississippi	University	63000
total			63000
New Jersey	Princeton	Princeton	262439
total			262439
New York	Columbia	New York	150000
	U. Rochester	Ithaca	230000
	Rockefeller	New York	70000
	SUNY-SB	Stony Brook	770000
total			1220000
North Carolina	Duke	Durham	185000
	NC State	Raleigh	50000
total			235000
Oklahoma	U. Oklahoma	Norman	95000
total			95000
Oregon	U. Oregon	Eugene	60000
	Oregon State	Corvallis	109913
total			169913
Pennsylvania	Carnegie-Mellon	Pittsburgh	90000
	U. Pennsylvania	Philadelphia	1265000
	Penn State	State College	15000
	U. Pittsburgh	Pittsburgh	125000
total			1495000

Tennessee	U. Tennessee	Knoxville	40000
	Vanderbilt	Nashville	10000
total			50000
Texas	HARC	The Woodlands	2246839
	Rice	Houston	10000
	SMU	Dallas	95810
	Texas A&M	College Station	190000
	UT-Austin	Austin	50000
	UT-Dallas	Dallas	21000
total			2613649
Virginia	VPI	Blacksburg	39100
total			39100
Washington	U. Washington	Seattle	334500
total			334500
Wisconsin	U. Wisconsin	Madison	180000
total			180000
TOTAL UNIVERSITY FUNDING FOR FY 1990			12293859

Question: For each state, show, for FY 1990 -- universities submitting proposals to Texas for SSC research funds.

Answer: I will be pleased to provide this information for the record.

(The information follows:)

PRELIMINARY PROPOSALS RECEIVED BY THE COMMISSION

Regional Rocky Mountain University Consortia

HEP Research Laboratory
Detector Development, Fabrication and Testing

Principal/Lead Scientist and University:
Dr. Uriel Nauenberg, University of Colorado

University Team Members:
University of Arizona
Colorado State University
University of Denver
University of Nebraska
Utah State University
University of Colorado
Colorado School of Mines
University of Kansas
University of Oregon
University of Wyoming

Southern Association for High-Energy Physics (SAHEP)

SAHEP Steering Committee

Theoretical Research

Principal/Lead Scientist and University:
Dr. James Reidy, University of Mississippi

University Team Members:
Duke University
Louisiana State University
ORAU
University of Florida
University of South Alabama
University of South Carolina
Vanderbilt University
Virginia Polytechnic Institute and State University
Florida State University
University of Alabama
ORNL
University of Oklahoma
University of Tennessee
University of Virginia

The Prairie View A & M University Research Foundation

Particle Detector Research Center

Principal/Lead Scientist and University:
Dr. Dennis Judd, Prairie View A & M University

University Team Members:
Texas A & M University
Texas Southern University
Rice University
University of Houston

Research and Education Collaboration
University of Houston

Institute for Beam Particle Dynamics

Principal/Lead Scientist and University:
Dr. Roy Weinstein, University of Houston

University Team Members:
- University of California
- Johns Hopkins University
- Iowa State University
- Northeastern University
- Virginia Polytechnic Institute and State University
- Florida State University
- University of Houston
- New York University
- Vanderbilt University

State University of New York at Stony Brook

Advanced Engineering Network for SSC Detector Design

Principal/Lead Scientist and University:
Dr. Michael Marx, Stony Brook

University Team Members:
- University of Arizona
- Carnegie-Mellon University
- Grumman Corporation
- Michigan State University
- University or Oregon
- Princeton University
- University of Texas, Austin
- SUNY, Stony Brook
- University of California (San Diego)
- University of Massachusetts (Amherst)
- Brookhaven National Laboratory
- Boston University
- M.I.T.
- Louisiana State University
- Martin Marietta Corporation
- University Of Pittsburgh
- University of Rochester
- University of Washington
- Yale University

Physics at Supercollider Energies
Boston/Harvard University

Theoretical Research

Principal/Lead Scientist and University:
Dr. Kenneth Lane, Boston University
Dr. Howard Georgi, Harvard University

University Team Members:
- Boston University
- Harvard University

Research & Education Initiative in Particle Physics & Technology

New Mexico Center for High Energy Physics and Technology

Principal/Lead Scientist and University:
Dr. Hobson Wildenthal, University of New Mexico

University Team Members:
University of New Mexico
Los Alamos National Laboratory
State of New Mexico

A Hybrid Central Tracking Chamber for the SSC

Florida State University

Construction and Testing of a Prototype Hybrid Central Tracking Chamber (CTC)

Principal/Lead Scientist and University:
Dr. Alfred T. Goshaw, Duke University
Dr. Stephen Reucroft, Northeastern University

University Team Members:
Duke University
N. Carolina State University
University of Florida
Hampton University
Supercomputer Computation Research Institute
Quantum Research Services, Inc.
Oak Ridge National Laboratory
Northeastern University
RCA
Florida State University

Supercomputer Computations Research Institute

Florida State University

Vectorized Monte Carlo Detector Simulation Program for Electromagnetic Interactions

Principal/Lead Scientist and University:
S. Youssef, Florida State University
W. Martin, T.C. Wan and S. Wilderman, University of Michigan

University Team Members:
Florida State University
University of Michigan

Question: For each state, show, for FY 1990 -- universities receiving SSC funding from Texas.

Answer: No universities have as yet received SSC funding from Texas.

Question: For each state, show, for FY 1990 -- URA universities.

Answer: I will be pleased to provide this information for the record.

(The information follows:)

4/19/90

Universities Research Association, Inc. Member Institutions

Alabama	University of Alabama
Arizona	Arizona State University University of Arizona
California	California Institute of Technology University of California, Berkeley University of California, Irvine University of California, Los Angeles University of California, San Diego San Francisco State University Stanford University
Colorado	University of Colorado at Boulder
Connecticut	Yale University
Florida	Florida State University
Hawaii	University of Hawaii at Manoa
Illinois	University of Chicago Northern Illinois University* University of Illinois- Urbana-Champaign Northwestern University
Indiana	Indiana University Notre Dame University Purdue University
Iowa	Iowa State University
Louisiana	Louisiana State University Tulane University
Maryland	Johns Hopkins University University of Maryland
Massachusetts	Brandeis University Harvard University Massachusetts Institute of Technology University of Massachusetts Northeastern University Tufts University
Michigan	Michigan State University University of Michigan
Minnesota	University of Minnesota
Missouri	Washington University

New Jersey	Princeton University
	Rutgers University
New York	Columbia University
	Cornell University
	University of Rochester
	Rockefeller University
	SUNY at Buffalo
	SUNY at Stony Brook
	Syracuse University
North Carolina	Duke University
	University of North Carolina
Ohio	Case Western Reserve University
	Ohio State University
Oklahoma	University of Oklahoma
Pennsylvania	Carnegie-Mellon University
	Pennsylvania State University
	University of Pennsylvania
	University of Pittsburg
Rhode Island	Brown University
Tennessee	University of Tennessee, Knoxville
	Vanderbilt University
Texas	Prairie View A&M University*
	University of Houston
	Rice University
	Texas A&M University
	University of Texas at Arlington
	University of Texas at Austin
Utah	University of Utah
Virginia	Virginia Polytechnic Institute
	University of Virginia
	College of William and Mary
Washington	University of Washington
Wisconsin	University of Wisconsin- Madison
Canada	McGill University
	University of Toronto

* denotes an associate member institution

Question 2: Provide a schedule of projected expenditures for the major components of the project and the project total year-by-year until operation of the facility.

Answer: The schedule of projected expenditures for the earlier project baselines were presented in the Construction Project Data Sheet for the SSC included in the President's FY 1991 budget request. All of this information is subject to change when the new project baseline is established later this year. I will be pleased to provide that information for the record.

(The information follows:)

FY 1991 CONGRESSIONAL BUDGET REQUEST
SUPERCONDUCTING SUPER COLLIDER
DETAILS OF COST ESTIMATE
(B/A In Millions)

a. Engineering, Design, Inspection, and Administration @ approximately 23% of item b			$ 664,000
b. Construction Costs			2,857,000
1. Conventional Systems		$ 823,000	
(a) Improvements to Land (site preparations, roads, fencing, and landscaping)	$ 32,000		
(b) General Utilities (electrical, water, communications & waste systems)	90,000		
(c) Campus Buildings	61,000		
(d) Injector Facilities (Structures & underground enclosures)	57,000		
(e) Collider Facilities	496,000		
(f) Experimental facilities (Structures & underground enclosures)	87,000		
2. Technical Systems		2,034,000	
(a) Injector Systems	270,000		
(b) Collider Ring Systems			
(1) Magnets	1,431,000		
(2) Cryogenics	172,000		
(3) Other systems	161,000		
c. Standard Equipment (vehicles and office equipment)			22,000
d. Contingency @ 21% of above costs			757,000
Total Estimated Cost			$4,300,000

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*Based on March 1986, Conceptual Design Report.

FY 1991 CONGRESSIONAL BUDGET REQUEST
SUPERCONDUCTING SUPER COLLIDER
FUNDING SCHEDULE OF PROJECT FUNDING AND OTHER RELATED FUNDING REQUIREMENTS
(B/A in Millions)

	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98[b]	Total
Total project cost												
1. Total facility cost[a]												
(a) Construction line item......	$ 0	$ 0	$209.0	$368.9	$625.0	$673.0	$669.0	$641.0	$641.0	$473.1	$ 0	$4,300.0[c]
2. Other project costs[d]												
(a) R&D necessary to complete construction....	33.0	56.6	59.0	71.3	39.0	23.0	15.0	12.0	3.0	1.7	0	313.6
(b) General Laboratory Equipment.......	0	13.0	12.0	23.0	5.0	2.0	1.0	1.0	1.0	0	0	58.0
(c) Pre-operations	0	0	0	0	0	5.0	15.0	40.0	70.0	110.0	120.0	360.0[e]
(d) Initial Complement of Detectors and Computers.......	0	8.0	17.7	49.0	90.0	100.0	88.0	143.0	182.8	163.5	0	842.0[f]
(e) Preliminary Design Technical Systems Development	0	20.0	0	0	0	0	0	0	0	0	0	20.0
Total other project costs.......	33.0	97.6	88.7	143.3	134.0	130.0	119.0	196.0	256.8	275.2	120.0	1,593.6
Total project cost......	$33.0	$97.6	$297.7	$512.2	$759.0	$803.0	$788.0	$837.0	$897.8	$748.3	$120.0	$5,893.6
Estimated non-Federal Contributions g/	0	0	80.0	200.0	200.0	300.0	300.0	300.0	300.0	120.0	0	1,800.0
Federal Share	$33.0	$97.6	$217.7	$312.2	$559.0	$503.0	$488.0	$537.0	$597.8	$628.3	$120.0	$4,093.6

a/ Based on March 1986, Conceptual Design Report. The Department and the SSC Laboratory are in the process of developing a revised project conceptual design along with cost estimate and schedule. This is a rapidly evolving situation and appropriate revisions will be incorporated into the budget request and outyear plans after the new technical, cost and schedule baselines are validated.

b/ Construction completion 2nd quarter FY 1998.

c/ Assumes site provided at no cost to DOE. Total construction cost including anticipated international, state, local and industrial contributions.

d/ Inflation indices used to convert other project costs to then year dollars: FY 1989, 3.1%; FY 1990, 2.6%; FY 1991, 2.2%; FY 1992 and all outyears, 2.15%.

e/ Pre-operations shown only through construction project completion.

f/ Full cost of initial complement of detectors (including R&D) and central computer.

g/ The projection of a total non-Federal contribution to the SSC of $1.8 billion and the year-by-year spread of the estimated contributions are preliminary estimates. The exact funding type and timing of the non-Federal contributions will depend on which SSC systems are provided by others and how these systems fit into the project schedule. Improved firm estimates will be available after completion of definitive agreements with the State of Texas and foreign contributors.

Question:	How will the project expenditure year-by-year compare with the estimated budget for the rest of high-energy physics in those years?

Answer: We would be pleased to provide the outyear projections for the SSC project and the High Energy Physics program associated with the FY 1991 budget request before Congress. These projections are traditionally prepared by the Administration for a five year period only. Therefore, outyear projections beyond those developed for the FY 1991 Congressional budget are not available at this time. It should be noted that these estimates are updated annually as part of the President's annual budget submission to the Congress. I will be pleased to provide that information for the record.

(The information follows:)

FY 1991 Congressional Budget Request
Analysis of Outyear Impact
Budget Authority
(dollars in thousands)

	FY 1991	FY 1992	FY 1993	FY 1994	FY 1995
High Energy Physics......	$621,187	$651,100	$674,700	$689,700	$752,100
Superconducting Super Collider..............	317,866	570,300	515,600	500,800	550,100

Question 3: What is the estimated operation cost for the facility?

Answer: The estimated annual funding requirements for normal operation after completion of construction is $313.3 million in FY 1991 dollars. The projected costs for laboratory operations, capital equipment, general plant projects and accelerator improvements are included.

Question: How will this compare to the operating budget for the rest of high energy physics at the time?

Answer: Our current projections are that the operating budget of the present High Energy Physics Program will continue relatively unchanged (except for inflation) during the period of construction of the SSC. At this level, the operating budget of the SSC will be significantly smaller than the budget for the rest of the high energy physics program at that time.

Question: **What specific physics facilities will be shut down or used less intensively by the time the SSC begins operation?**

Answer: We have no specific plans to shut down any of the current HEP accelerator centers. While we anticipate that there may be some significant reductions in the use of the existing HEP facilities by the time the SSC begins operation, we are not in a position to identify specifically what those reductions will be or what budgetary resources will become available. Facility utilization should be determined by the priority of the particular science questions being studied. The precise physics questions which will have high priority toward the end of the 1990's will be determined, in large part, by key scientific discoveries and breakthroughs which will occur in the next decade. It is impossible to predict in detail this far in advance what these discoveries and breakthroughs will be and what the implications for facility utilization will be.

The HEP program has, over the last two decades, closed several accelerator laboratories in response to completion of planned research activities and to assist in the overall optimization of the HEP research program. The SPEAR electron-positron colliding beam facility at SLAC was shut down for HEP research in 1989, and is currently being operated as a synchrotron radiation facility solely with funding from other sources. The Zero Gradient Synchrotron at ANL was shut down in 1979 after an extended exploitation of its world unique polarized protron beam capability. The Cambridge Electron Accelerator (CEA) was shut down in 1973 when the similar, but much higher intensity, SPEAR colliding beam facility at SLAC came into operation. The CEA had earlier (1970) been converted from an electron synchrotron with a fixed target capability to an electron-positron colliding beam facility. The Bevatron at LBL was transferred to the nuclear physics program in 1974 reflecting a major shift in the research focus of the machine. HEP support for the Princeton-Pennsylvania Accelerator ended in 1971 thus terminating its program in HEP.

These shutdowns and transfers were determined in response to the natural progression and evolution of the HEP program. As newer or more capable facilities came into operation selected older facilities were terminated, transferred, or converted to more specialized programmatic activities. We intend to continue to monitor and review, with the advice and assistance of HEPAP as appropriate, the facility needs of the HEP program as the programs at the present HEP accelerator centers mature and evolve, and as the SSC research program begins. We anticipate that, based on this monitoring and review, there will be significant shifts in the facility needs of the HEP program by the SSC era. As we have indicated, we are not in a position to specify what these shifts will be.

Question: What budgetary resources will this make available?

Answer: As indicated previously, we are not in a position to specify which facilities will be shut down or used less intensely, thus, we cannot specify what budgetary resources will be made available.

Question 4: In order to get a picture of the commitments being made that will claim resources in the future, please provide the Subcommittee with a year-by-year estimate breaking down the total construction, capital equipment, and operating costs that must be covered by appropriations between FY 1991 and FY 1999 for DOE's "Fortifying Foundations" budget category (SSC, High Energy and Nuclear Physics, Basic Energy Sciences, and Biological and Environmental Research), including the costs of the SSC, the Continuous Electron Beam Accelerator Facility, the Relativistic Heavy Ion Collider, the 1-2 GeV Synchrotron, the 6-7 GeV Synchrotron, and any proposed neutron source for solid state physics.

Answer: We would be pleased to provide the outyear projections associated with the FY 1991 budget request before Congress. These projections are traditionally prepared by the Administration for a five year period only. Therefore, outyear projections beyond those developed for the FY 1991 Congressional budget are not available at this time. It should be noted that these estimates are updated annually as part of the President's annual budget submission to the Congress.

(The information follows:)

FY 1991 CONGRESSIONAL BUDGET REQUEST
BUDGET AUTHORITY IN THOUSANDS OF DOLLARS

	FY 1991	FY 1992	FY 1993	FY 1994	FY 1995
Superconducting Super Collider					
Operating Expenses	116,000	103,600	77,600	77,600	109.100
Capital Equipment	33,000	41,700	65,000	54,200	100,000
Construction	368,866	625,000	673,000	669,000	641,000
Subtotal	517,866	770,300	815,600	800,800	850,100
Less Est. Non-Federal	200,000	200,000	300,000	300,000	300,000
Total	317,866	570,300	515,600	500,800	550,100
High Energy Physics					
Operating Expenses	494,155	515,000	534,100	541,600	569,300
Capital Equipment	88,180	90,500	92,700	93,700	95,400
Construction	38,852	45,600	47,900	54,400	87,400
Total	621,187	651,100	674,700	689,700	752,100
Nuclear Physics					
Operating Expenses	215,529	228,100	240,800	261,600	260,100
Capital Equipment	26,700	28,300	30,000	31,000	32,000
Construction	88,500	97,900	95,300	100,500	101,000
Total	330,729	354,300	366,100	393,100	393,100
(CEBAF Construction)	(65,000)	(38,200)	(5,000)	0	0
(RHIC Construction)	(15,000)	(50,000)	(80,000)	(90,000)	(90,000)
Basic Energy Sciences					
Operating Expenses	503,629	551,986	578,138	598,051	616,962
Capital Equipment	37,019	37,500	38,000	38,500	39,000
Construction	108,034	109,500	116,900	105,500	57,900
Total	648,682	698,986	773,038	742,051	713,862
(1-2 GeV Construction)	(23,000)	(6,364)	0	0	0
(6-7 GeV Construction)	(75,000)	(92,659)	(105,000)	(93,000)	(45,000)
Biological and Environmental Research					
Operating Expenses	323,688	333,915	335,115	346,907	321,799
Capital Equipment	11,621	15,100	19,500	20,000	20,500
Construction	3,485	3,500	10,200	9,700	9,800
Total	338,794	352,515	364,815	376,607	352,099

Question 5: Under the President's proposed FY 1991 budget, how many full days of operation are planned for each of DOE's major existing facilities? Provide a facility-by-facility breakdown.

Answer: I will be pleased to provide that information for the record.

(The information follows:)

FACILITY UTILIZATION
Weeks of Operation

	FY 1991
Nuclear Physics	
Argonne National Laboratory, ATLAS	38
Brookhaven National Laboratory, TANDEM, AGS	10
Lawrence Berkeley Laboratory, Bevalac & 88-Inch	48
Los Alamos National Laboratory, LAMPF	22
Massachusetts Institute of Technology, Bates	20
Oak Ridge National Laboratory, Holifield	37
High Energy Physics	
Fermi National Accelerator Laboratory	36
Brookhaven National Laboratory	14-18
Stanford Linear Accelerator Laboratory	36
Basic Energy Sciences	
Brookhaven National Laboratory	
NSLS	40-44
HFBR	48
Oak Ridge National Laboratory, HFIR	48
Stanford Synchrotron Radiation Laboratory	
SPEAR	30
PEP	16
Argonne National Laboratory, IPNS	26
Sandia National Laboratory, CRF	52
Los Alamos National Laboratory, LANSCE	26

Question: How do you answer the criticism that DOE is continually seeking to build new facilities, but then fails to recommend sufficient funds to fully utilize these facilities once they become operational?

Answer: The optimum HEP program requires establishing a balance between three major program components: 1) Operation of existing accelerator facilities, 2) support for research utilizing these facilities, and 3) provision for the new facilities and/or facility upgrades needed to maintain the capabilities of the US HEP program in its world forefront position. A substantial unbalance in these factors can have serious consequences. Oversupport of facility operations at the expense of research support can lead to wasted beam time if the funding to install and operate experiments is depleted. Undersupport of facility operations leads to excessive and costly delays in completing experiments. Adequate but balanced funding needs to be provided for facility upgrades and the provision of new facilities. Otherwise, the technical capabilities of the facilities will not keep up with the ever escalating needs of the science. Inadequate provision for future capabilities will lead, in a few years, to second class facilities and stagnation.

Question: Doesn't intensive use of existing facilities have a positive impact on the development of the next generation of U.S. scientists and engineers? How does this consideration enter into your decisionmaking in funding operations at existing facilities.

Answer: Development of the next generation of scientists and engineers is certainly one of the very important factors which must be considered in determining the balance described above and provision of opportunities for current research is essential for that development. Indeed, the health of the HEP research community in the period between now and when the SSC begins to produce physics is a major concern and we believe it is essential to maintain a healthy and productive HEP research program in this interim so that the US will be well positioned to take maximum scientific advantage of the nation's investment in the SSC.

IV. International Cooperation

Question 1: **What contributions from foreign sources have been pledged so far?**

Answer: The only country that has made a written statement of intent to contribute to the SSC is India. However, all countries with a capability in high energy physics have expressed an interest in the SSC program. This includes almost all the countries that are members of the Organization for Economic Cooperation and Development.

Question: Are these cash or in-kind contributions? Describe the nature of the in-kind contributions.

Answer: India is interested in contributing manpower and hardware, in-kind, to the extent of $50 million over a 10-year period.

Question 2: What are the factors -- advantages and disadvantages -- affecting your decision making on foreign participation in the technology development for the SSC, for example, in the case of the development of magnets.

Answer: The major factors affecting a decision on foreign participation in the technology development for the SSC, for example, in the case of the development of magnets include: technology transfer and procurement policy.

With regard to technology transfer, any foreign companies that we anticipate would participate in the SSC already have the technology. In the U.S., the high performance magnets for accelerators have been built at DOE Laboratories and, hence, this technology will have to be transferred to U.S. industry. Therefore, from the standpoint of technology transfer, the U.S. is more likely to gain than lose from any foreign participation.

With regard to procurement policy, unless an exemption is requested and granted, full and open competition will prevail. The advantage would be that the best bid would be awarded regardless of the origin. The disadvantage would be that if a U.S. firm does not receive the award, any benefits that might accrue as a result of funding such a procurement would only go to foreign entities.

Question: How does DOE rank these factors?

Answer: The DOE is still working with other Administration offices to come to a conclusion on the proper policy for foreign participation.

Question: Do you intend to accept bids from foreign firms for development or supply of magnets for the project?

Answer: We are consulting with Congress and other elements of the Administration on the advisability of restricting bids to qualified domestic suppliers. In the absence of a specific notification to Congress, full and open competition will prevail.

Question: What forms of participation in SSC has DOE decided to accept?

Answer: DOE prefers unrestricted grants, qualified and needed manpower and services, and will consider accepting in-kind contributions.

Question: What forms of participation are under consideration but not yet accepted?

Answer: We are not considering other forms of participation at the moment.

Question 3: What foreign nations will you be talking to in seeking participation?

Answer: We will initially be talking primarily to the Economic Summit Countries (Italy, Japan, Canada, France, the Federal Republic of Germany, and the United Kingdom).

Question: What are the strengths of each of these nations in relation the SSC project?

Answer: In addition to a long tradition of collaborating with the U.S. in high energy physics research, they have the economic, industrial, scientific resource base and capability to make a contribution to the SSC program.

Question 4: What is your goal for the dollar value of foreign participation in the SSC project?

Answer: The goal is to maximize contributions from non-Federal sources. The State of Texas will contribute up to $1 billion for the construction of on-site facilities and other SSC systems. The Department is seeking the remainder from other nations, and is beginning negotiations as early as June 1990. Although the goal is to obtain up to one-third from non-Federal sources, a specific dollar value of these contributions will depend on the success of these discussions.

Question: If a lesser amount is contributed, will DOE recommend that appropriations make up the difference?

Answer: In such a case we would have to report to the Congress and the Administration on the reasons for a lesser amount, and then consult with the Congress and the Administration on the appropriate next steps.

Question: What is the level of foreign participation at which you would reconsider the project?

Answer: If we do not meet our goal of one-third of the total project cost from non-Federal sources, we would have to consult with the Congress and the Administration on the next steps.

Question: When will we know what foreign participation (and under what terms) will be available?

Answer: We feel confident that by the summer of 1991 we will have established the nature and scope of foreign participation in the SSC program.

V. H.R. 4380

Question 1: What is the Administration's position on H.R. 4380, a bill recently reported by the House Committee on Science and Space Technology to authorize appropriations for the SSC?

Answer: The Administration is supportive of H.R. 4380 as passed by the House but would prefer to delete language which would limit competition in a manner contrary to U.S. policy and law that seeks to achieve non-discriminatory trade and investment.

Question 2: Please provide the Subcommittee with an analysis of the provisions of the bill with your views and recommendations on these provisions.

Answer: From the point of view of the Department and its Office of Energy Research, we are generally supportive of the authorization bill passed by the House for the SSC. However, the Administration does object to limiting competition in a manner contrary to U.S. policy and law that seeks to achieve non-discrimination in trade and investment.

VI. Waste Management

Question 1: What are the radioactive waste management issues associated with the SSC project?

Answer: The SSC has no real issues associated with radioactive waste. The small amounts of low-level waste associated with materials from replaced components will be disposed of as required by law.

Question: What types and volumes of radioactive waste are produced during operation of the facility?

Answer: During operation, magnet materials and other components from the collider tunnel will require replacement. These removed components and materials constitute low level radioactive waste and will require disposal. This is projected at approximately 10,500 cubic feet per year. For comparison, Fermilab disposes of approximately 7,700 cubic feet of similar materials each year.

Question 1: What are the plans to dispose of the waste?

Answer: Disposal of this low-level radioactive waste is the responsibility of the DOE as provided for in the Low-Level Waste Policy Amendments Act of 1985. There will be no obligation on any state to accept these wastes. However, disposal at a state low-level radioactive waste facility (NRC licensed) as an option would be considered, if there were a willingness by the state(s) to accept these wastes. This assumes there is sufficient disposal site capacity and a cost savings to the Department.

Question 2: What are the plans for decommissioning the site?

Answer: At an appropriate time approaching its useful life, expected to be over 30 years, a decommissioning plan will be drawn up and approved to restore the site. No major difficulties are foreseen to restoring the site.

Department of Energy
Washington, DC 20585

June 7, 1990

The Honorable Wendell H. Ford
Chairman
Subcommittee on Energy Research
and Development
Committee on Energy and Natural Resources
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

On April 24, 1990, Dr. James F. Decker, Acting Director, Office of Energy Research, gave testimony before your subcommittee on Superconducting Super Collider programs.

Following that hearing, you submitted written questions for our response to supplement the record. Enclosed are the answers to those questions.

If you have any questions, please have your staff call Barbara Campbell on 586-8687. She will be happy to assist you or your staff.

Sincerely,

Jacqueline Knox Brown

Jacqueline Knox Brown
Assistant Secretary
Congressional and Intergovernmental Affairs

Enclosure

POST-HEARING QUESTIONS AND ANSWERS
FOR THE
APRIL 24, 1990, HEARING
BEFORE THE
SUBCOMMITTEE ON ENERGY RESEARCH AND DEVELOPMENT
COMMITTEE ON ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE
WITNESS: JAMES F. DECKER
ACTING DIRECTOR OF ENERGY RESEARCH

QUESTIONS FROM SENATOR FORD

Magnets

Question 1: When will the magnet design for the SSC be complete?

Answer: The design for the four-centimeter bore magnet has been completed and the contractor is now designing the five-centimeter bore magnet which was recently approved. The design will be an iterative process leading to a production magnet design in about 3 years. The design will go through prototype, pre-production and production phases, with the prototype design phase nearly complete. The process which will lead to this design is as follows: a competition will soon begin for an engineering development contractor for the collider dipole magnets. Vendor selection is expected late in FY 1990. Approximately 6 months after contract award, the SSC Laboratory will conduct a system design review which will determine the level of understanding of the requirements by the vendor. Approximately 20 months after contract award there will be a preliminary design review. The critical design review of the production magnet design will occur approximately 3 years after contract award.

Question: What is the present status of the work?

Answer: An inter-laboratory task force was formed early in 1990 to provide recommendations on design choices for the 5 centimeter collider dipole magnet. These recommendations are being incorporated by those performing the conceptual design work at the SSC Laboratory, Fermilab and Brookhaven.

Collider quadrupole design work is being done at Lawrence Berkeley Laboratory. First tests of 1-meter models of the latest design will begin soon.

Design work on the High Energy Booster (HEB) magnets is just getting underway.

Question: Who is doing the design work?

Answer: The design work is being managed by the SSC Laboratory and is being performed at the SSC Laboratory, Fermilab, Brookhaven and Lawrence Berkeley Laboratory. The SSC Laboratory has lead responsibility for the High Energy Booster dipoles. Lawrence Berkeley Laboratory has lead responsibility for quadrupoles. Fermilab has lead responsibility for collider dipole cryostats. Brookhaven has lead responsibility for collider dipole cold masses.

Question: Who is reviewing the work?

Answer: The SSC Laboratory has prime responsibility for ensuring that the work is completed properly. The Department will conduct technical reviews of the conceptual designs of each of the four key types of superconducting magnets before allowing the SSC Laboratory to issue industrial contracts. Consultants to the Department will assist in these reviews by providing additional technical and business expertise.

Question 2: Please explain the main features of the request for proposals DOE is issuing for SSC industrial magnet development and production.

Answer: The Department is not issuing a Request for Proposals (RFP). Universities Research Association, Inc., as the prime contractor assigned the responsibility to design, build and operate the SSC, will issue the RFP. The scope of the work will include technology transfer from the DOE laboratories to industry, engineering development of the magnet, pre-production and low rate production of the magnet, and an option for the purchase of production units. The SSC Laboratory also will have an option to purchase sufficient tooling to build all the required magnets in 3 years. The duration of this effort, called "Phase II", is 4 years.

The SSC Laboratory is expected to select two vendors in Phase II, the highest rated one will be the leader and the next rated, the follower. An option will be included to permit selection of only one vendor in the production phase, either the leader or the follower.

Question: **What roles will be available to foreign firms in this work?**

Answer: As currently constructed, foreign firms can either compete directly for the magnet contract, compete as part of a team with domestic firms, or provide magnets as donations.

If foreign donations in-kind of collider dipole magnets are arranged, the lead vendor will be required to train the foreign manufacturer to ensure that all the SSC dipole magnets meet the same specifications.

Question: Why was this role selected by DOE?

Answer: The Competition in Contracting Act provides for full and open competition in all procurements. Of course, foreign bids would be subject to the Buy America Act which provides a price advantage for domestic end products.

Question: How will this work be monitored for technical sufficiency and cost control?

Answer: The principal tool of the Department in monitoring projects is the formal annual or semiannual review. Additional technical reviews of particular aspects of the project may be scheduled by the Department as it sees fit.

The SSC Laboratory has been informed by the Department that it will conduct technical reviews of the conceptual designs of the 5 centimeter collider dipoles, the collider quadrupoles, the High Energy Booster (HEB) dipoles and the HEB quadrupoles. These reviews will take place before contract award in the first case and before the Request for Proposals (RFP) issuance in the other three cases. The Department will attend all formal reviews by the SSC Laboratory of the performance of their magnet subcontractors.

The on-site Project Manager will have direct control over project cost through change order and milestone approvals and contingency allocation to the SSC Laboratory consistent with the authority of DOE specified in the Project Management Plan. The Deputy Secretary controls key decision milestones established for the project and can direct a review of the project costs at any time based on the reporting and independent assessments provided to him.

Monthly reports with financial information are supplied by the SSC Laboratory to the Department. Efforts are underway which should allow the Department real time access to the SSC Laboratory's financial databases in FY 1991.

Question: **What were the significant factors governing your decisions on key issues in developing this request for proposals?**

Answer: Factors considered in developing the RFP were technical requirements for magnet uniformity, reliability, and manufacturability. Cost, including the means for ensuring adequate price competition for production of magnets after engineering development is completed, was also a factor.

Question: What are the criteria that will be used to determine selection?

Answer: The detailed selection criteria have not yet been determined, and will not be fixed until the draft criteria are commented on by industry. However, this engineering development contract is a technical competition; as such, price will not be scored, but will be part of the overall integrated assessment. Production magnets will be purchased through firm fixed price bids.

Question 3: Please discuss the development of detectors for the SSC.

Answer: At present, the program is in a research and development (R&D) and proposal preparation stage. A generic R&D program to investigate basic issues of detector performance was initiated in FY 1989 and will continue into mid-FY 1991. That program is funded currently at an annual rate of about $6 million. A detector subsystem R&D effort focusing on the design and testing of subsystems that might be appropriate for SSC experiments was initiated in FY 1990. This program is being funded at a level of about $10 million now and is expected to grow in FY 1991.

Question: What is the status of any request for proposals in this matter?

Answer: The Laboratory will receive expressions of interest (EOI) from groups interested in proposing SSC experiments on May 25, 1990. These EOI's will be reviewed by the SSC Laboratory's Program Advisory Committee (PAC) on July 14-20, 1990. The PAC will meet again on November 1-3, 1990, to begin to identify the areas of physics to be pursued in the initial set of experiments, make further recommendations on the subsystem R&D and the EOI's, and discuss the due date for proposals. Selection of the first round of experiments will involve an on-going process of review by the PAC of the R&D being done by the various collaborations involved.

Question: What role will be available to foreign firms in this work?

Answer: The detectors will be large, complex and sophisticated instruments. Large international collaborations of scientists are now forming, and they will submit in May 1990 so-called Expressions of Interest to the SSC Laboratory for scientific peer review. These will lead to detailed proposals that will also be peer reviewed and specific detectors approved to be built. The collaborations will be composed of scientific groups from many institutions. These groups will each furnish specific pieces, or subsystems, of the detectors. The U.S. groups will be largely funded with Federal monies and will follow the standard procurement processes. The foreign groups, using funding from their own governments, will procure their contributions to the detectors following their standard practice, presumably much of it coming from purchases within their own country.

Question: What are the considerations that led to this choice?

Answer: We did not see any basis to depart from normal Department of Energy procurement procedures for U.S.-funded SSC procurements. Our goal is to get the best product at a fair price within the constraints of procurement legislation. The foreign collaborators will obtain funding for detectors from their own governments and will follow their own standard procurement practices.

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